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THE

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PART X

THE PALAEMONIDAE

COLLECTED BY THE SIBOGA AND SNELLIUS EXPEDITIONS
WITH REMARKS ON OTHER SPECIES I.

SUBFAMILY PALAEMONINAE

BY

DR. L. B. HOLTHUIS
(Rijksmuseum van Natuurlijke Historie, Leiden)

With 52 figs. in the text

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THE PALAEMONIDAE COLLECTED BY THE SIBOGA AND SNELLIUS EXPEDITIONS, WITH REMARKS ON OTHER SPECIES. I.

SUBFAMILY PALAEMONINAE

BY

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(Rijksmuseum van Natuurlijke Historie, Leiden, Holland)

With 52 textfigures

INTRODUCTION

The family Palaemonidae is divided by Balss (1927a) in his general treatise on the Decapod Crustacea into 4 subfamilies: Typhlocaridinae, Desmocaridinae, Palaemoninae and Pontoniinae. In my opinion the separation of the Desmocaridinae and the Palaemoninae is not justified. On the other hand the genus *Euryrhynchus*, which up till now was placed in the subfamily Palaemoninae differs in so many respects from the other genera of that group that it cannot be maintained in the Palaemoninae; a new subfamily is erected here for it. The four subfamilies may be separated as follows:

1. The upper antennular flagellum with the two rami free throughout their length. Second pleopods of the male without an appendix masculina. Appendix interna absent from the second pleopod in the females. No pleurobranch on the base of the third maxillipede.

Euryrhynchinae nov. subfam.

— The upper antennular flagellum with the two rami fused in the basal part. Second pleopods of the male generally with an appendix masculina. Female with an appendix interna on the second pleopod. 2

2. Lateral surface of the carapace with a longitudinal suture-line over its whole length, extending posteriorly from the antennal region. No pleurobranch on the third maxillipede.

Typhlocaridinae

— Lateral surface of the carapace without such a longitudinal suture-line 3

3. Pleurobranchs absent from the third maxillipedes. Posterior margin of the telson with three pairs of spines (except in Anchistioides, where this number is smaller)

Pontoniinae

is entirely constant in all other species of the group. If, however, this character is not considered to be of generic value, then the genera *Palaemon, Leptocarpus, Cryphiops* and *Macrobrachium* must be merged into one large genus, which already from a practical point of view, is undesirable.

5. The genus *Cryphiops* Dana (1852) is synonymized here with *Bithynis* Philippi (1860), because the type and only species of Dana's genus, *Cryphiops spinulosomanus,* proves to be only an abnormal specimen of *Bithynis caementarius.* As the name *Cryphiops* is published before that of *Bithynis,* it must be used instead of Philippi's name.

6. The species described by De Man (1881) as *Leander celebensis,* which is identical with *Palaemonetes hornelli* Kemp (1925), differs from the other species of *Palaemonetes* in almost the same characters as *Leander* differs from *Palaemon,* it is therefore made here the type of a new genus *Leandrites.*

7. When studying American Palaemonid material in the U.S. National Museum at Washington, D.C., I was able to examine specimens of *Euryrhynchus wrzesniowskii* Miers, and I came to the conclusion that the genus *Euryrhynchus* cannot be maintained in the subfamily Palaemoninae, but has to be placed in a new subfamily Euryrhynchinae nov.

8. A further result of the examination of the American material is that part of the species placed up till now in the genus *Palaemonetes,* namely the cave forms from Cuba, have to be placed in a new genus, while also a new genus has to be erected for *Palaemon morleyi* Creaser. *Palaemonetes antrorum* Benedict is made the type of a new subgenus of the genus *Palaemonetes.*

Key to the genera and subgenera of Palaemoninae

1. Supraorbital spine present . . . . . *Desmocaris*
— Supraorbital spine absent 2
2. Branchiostegal spine present 3
— Branchiostegal spine absent 7
3. Mandible without palp. 4
— Mandible with palp 5
4. First pleopod of the male with a well developed appendix interna on the endopod. Branchiostegal groove absent. Propodus of fifth pereiopod without transverse rows of setae in the distal part of the posterior margin. Lower margin of the rostrum with a double row of setae, which are placed some distance above the bases of the lower teeth . . . . . *Leandrites*
— First pleopod of the male without an appendix interna on the endopod. Branchiostegal groove visible as a sharp line. Propodus of the fifth pereiopod with transverse rows of setae in the distal part of the posterior margin. Lower margin of the rostrum generally with a single row of setae, if with a double fringe then these hairs are placed close near the lower margin . . . . . *Palaemonetes*
a. Eyes with pigment. Second legs much stronger than first. Outer margin of uropodal exopod ending in a tooth and a movable spine . . . subgen. *Palaemonetes*
— Eyes without pigment. Second legs about as strong as the first. Outer margin of uropodal exopod ending in a tooth, no movable spine present . subgen. *Alaocaris*
5. Eyes without pigment, cornea reduced. Anterior margin of basal segment of

antennular peduncle concave, gradually merging into a strong anterolateral spine. No branchiostegal groove on the carapace. Propodus of fifth pereiopod with transverse rows of hairs in the distal part of the posterior margin. Mandibular palp two-jointed . . . . . *Creaseria*

— Eyes distinctly pigmented, cornea well developed. Anterior margin of the basal segment of the antennular peduncle rounded, anterolateral spine small. . . 6

6. First pleopod of the male with a well developed appendix interna on the endopod. Branchiostegal groove absent. Propodus of fifth pereiopod without transverse rows of setae in the distal part of the posterior margin. Lower margin of the rostrum with a double row of setae, which are placed some distance above the bases of the lower teeth. The two median setae of the posterior margin of the telson very strong. Mandibular palp two-jointed. . . *Leander*

— First pleopod of the male without or with a rudimental appendix interna on the endopod. Branchiostegal groove generally present, visible as a sharp line. Propodus of the fifth pereiopod with transverse rows of setae in the distal part of the posterior margin. Lower margin of rostrum generally with a single row of setae; in those cases where a double fringe is present, these setae are placed close near the lower margin of the rostrum. The two median spines of the posterior margin of the telson are slender . . . . . *Palaemon*

a. Rostrum with an elevated basal crest of teeth. Pleurae of fifth abdominal segment with the apex broadly rounded. Mandibular palp three-jointed. b

— Rostrum without an elevated basal crest. Pleurae of fifth abdominal segment generally ending in a small sharp point. Branchiostegal groove present. . c

b. Dactyli of last three legs enormously lengthened, longer than carpus and propodus together. No branchiostegal groove on the carapace. Stylocerite with a large tooth on the upper surface. . . . . subgenus *Nematopalaemon*

— Dactyli of last three legs always shorter than the propodus, never excessively long. Branchiostegal groove present on the carapace. Stylocerite without a large dorsal tooth. . . . . subgenus *Exopalaemon*

c. Mandibular palp two-jointed . . . . . subgenus *Palaeander*

— Mandibular palp three-jointed . . . . . subgenus *Palaemon*

7. Hepatic spine absent. 8

— Hepatic spine present [1]) 10

8. Mandible without palp. Eyes without pigment . . . . . *Troglocubanus*

— Mandible with a three-jointed palp. Eyes distinctly pigmented 9

9. Second legs slender, smooth; carpus 1.5 times or more as long as the chela. Rostrum elongate, reaching beyond the scaphocerite . . . . . *Leptocarpus*

— Second legs robust, spinulate; carpus less than half as long as the chela. Rostrum very short and high, not reaching the end of the scaphocerite . . . *Cryphiops*

1) In *Macrobrachium hildebrandti* sometimes the hepatic spine is absent; this species may be distinguished, however, from *Cryphiops* by the smooth second pereiopods, from *Leptocarpus* by the shorter carpus of the second pereiopods, which is about as long as the palm, and from *Troglocubanus* by the presence of a three-jointed mandibular palp, and well pigmented eyes.

10. Mandibular palp absent. Dactylus of last three legs simple . . . . . *Pseudopalaemon*
— Mandibular palp present 11
11. Dactylus of last three legs simple . . . . . *Macrobrachium*
— Dactylus of last three legs biunguiculate . . . . . *Brachycarpus*

List of all known species of Palaemoninae [1])

Desmocaris Sollaud, 1911 a (Vid. p. 2)

Type: *Palaemonetes trispinosus* Aurivillius

trispinosa (Aurivillius, 1898). Synonym: *Palaemonetes trispinosus* Aurivillius, 1898. Distribution: West Africa from Gold Coast to Belgian Congo. Fresh water.

Creaseria nov. gen.

Type: *Palaemon morleyi* Creaser

morleyi (Creaser, 1936). Synonym: *Palaemon morleyi* Creaser, 1936. Distribution: Yucatan, Mexico. In caves. Fresh water.

Leander E. Desmarest, 1849

Synonym: *Urocaridella* Borradaile, 1915.

Type: *Leander erraticus* E. Desmarest

kempi nov. spec. Distribution: Celebes, Talaud Islands (Malay Archipelago). Litoral from. Vid. p. 31.

tenuicornis (Say, 1818). Synonyms: *Astacus Locusta* Fabricius, 1781 (non Pennant, 1777); *Palaemon Locusta* Fabricius, 1798; ? *Peneus punctatissimus* Bosc, 1801; *Palaemon tenuicornis* Say, 1818; ?*Penaeus adspersus* Tilesius, 1818; *Palemon natator* H. Milne Edwards, 1837; *Palemon tenuirostre* H. Milne Edwards, 1837; *Palaemon latirostris* De Haan, 1841; *Leander erraticus* E. Desmarest, 1849; *Leander natator* Stimpson, 1860; *Palaemon torensis* Paulson, 1875; *Palaemon* (*Leander*) *erraticus* Thallwitz, 1892; *Palaemon* (*Leander*) *latirostris* Thallwitz, 1892; *Palaemon* (*Leander*) *tenuirostris* Thallwitz, 1892; *Leander paulensis* Ortmann, 1897; *Palaemon paulensis* Luederwaldt, 1919. Distribution: Circumtropic (though not yet reported from the East Pacific region), among floating weeds and near the shores. Vid. p. 26.

urocaridella nom. nov. Synonym: *Urocaridella gracilis* Borradaile, 1915 (non *Leander gracilis* Smith, 1869). Distribution: Indo-westpacific region from India to the Malay Archipelago. Litoral form. Vid. p. 28.

Leandrites nov. gen.

Type: *Leander celebensis* De Man

celebensis (De Man, 1881). Synonyms: *Leander celebensis* De Man, 1881; *Palaemon* (*Leander*) *celebensis* Thallwitz, 1892; *Palaemonetes hornelli* Kemp, 1925; *Leander wieneckei* De Man MSS. Distribution: S. India, Java, Celebes. Litoral form. Vid. p. 36.

indicus nov. spec. Distribution: Celebes. Litoral form. Vid. p. 37.

stenopus nov. spec. Distribution: Java. Litoral form. Vid. p. 40.

[1]) See also the addendum at the end of this paper.

Palaemon Fabricius, 1798

Subgenus **Palaemon** Fabricius, 1798

Type: *Cancer Squilla* Linnaeus

affinis H. Milne Edwards, 1837. Synonyms: *Palaemon Quoianus* H. Milne Edwards, 1837; *Leander serenus* Heller, 1862a; *Leander affinis* Miers, 1876; *Leander Quoyanus* Filhol, 1886. Distribution: Falkland Islands?, New South Wales, Tasmania, New Zealand, Campbell and Chatham Islands. Litoral form. Vid. p. 76.

belindae (Kemp, 1925). Synonym: *Leander belindae* Kemp, 1925. Distribution: S. India, Gulf of Manaar. Litoral form.

capensis (De Man, 1897). Synonym: *Leander capensis* De Man, 1897. Distribution: S. Africa. Fresh water. Vid. p.74.

concinnus Dana, 1852. Synonyms: *Palaemon exilimanus* Dana, 1852; *Leander longicarpus* Stimpson, 1860; *Palaemon longicarpus* Hilgendorf, 1869; *Leander concinnus* De Man, 1892; *Palaemon (Leander) exilimanus* Thallwitz, 1892; *Palaemon lagdaoensis* Blanco, 1939. Distribution: Indo-westpacific region from the Red Sea and E. Africa to Hongkong, the Malay Archipelago and Oceania. Litoral form, also in brackish and even fresh waters. Vid. p. 61.

debilis Dana, 1852. Synonyms: *Palaemon debilis attenuatus* Dana, 1852; *Leander debilis* Stimpson, 1860; *Leander gardineri* Borradaile, 1901; *Leander attenuatus* Lenz, 1901; *Leander beauforti* J. Roux, 1923; *Palaemonetes pacificus* Gurney, 1939. Distribution: Indo-westpacific region from the Red Sea and the Western Indian Ocean to the Riukiu Archipelago and the Hawaiian and Tuamotu Islands. Litoral form, also in brackish and fresh waters. Vid. p. 66.

gladiator Holthuis, 1950. Distribution: Clipperton Island, Galápagos Islands. Litoral form.

gracilis (Smith, 1871). Synonym: *Leander gracilis* Smith, 1871. Distribution: W. America from Nicaragua to S. Panama. Fresh water.

gravieri (Yu, 1930a). Synonym: *Leander Gravieri* Yu, 1930a. Distribution: N. China (Tientsin and Tangkoo), Korea. Vid. p. 82.

hancocki Holthuis, 1950. Distribution: Colombia and Ecuador. Fresh water.

longirostris H. Milne Edwards, 1837. Synonyms: *Palaemon Edwardsii* Heller, 1863; *Leander Edwardsii* (with the vars. *brevidigitata, prototypa* and *Helleri* and the forms *typica, similis, brevirostris, simplicior* and *intermedia*) Czerniavsky, 1884; *Leander longirostris* De Man, 1915a; *Leander longirostris* var. *robusta* De Man, 1924. Distribution: From England and N.W. Germany southwards into the Mediterranean and the Black Sea. Brackish, sometimes even fresh water; in estuaries of large rivers. Vid. p. 86.

macrodactylus Rathbun, 1902b. Synonym: *Leander macrodactylus* Parisi, 1919. Distribution: Japan and China.

miyadii (Kubo, 1938). Synonym: *Leander miyadii* Kubo, 1938. Distribution: Manchuria.

ortmanni Rathbun, 1902b. Synonym: *Leander longipes* Ortmann, 1890; *Palaemon (Leander) longipes* Thallwitz, 1892. Distribution: Japan and China. Litoral form. Vid. p. 80.

pacificus (Stimpson, 1860). Synonym: *Leander pacificus* Stimpson, 1860; *Leander peringueyi* Stebbing, 1915; *Leander gilchristi* Stebbing, 1915. Distribution: Indo-westpacific region from Red Sea and Cape of Good Hope to Japan and the Hawaiian Islands. Litoral form. Vid. p. 87.

pandaliformis (Stimpson, 1871). Synonyms: *Leander pandaliformis* Stimpson, 1871; *Leander Poti-*

tinga Müller, 1892; *Palaemon* (*Leander*) *potitinga* Thallwitz, 1892; *Palaemonetes cubensis* Hay, 1903; *Leander cubensis* Kemp, 1925; *Palaemon cubensis* Schmitt, 1935. Distribution: Eastcoast of America from Guatemala to S. E. Brazil, West Indies. Fresh and brackish water.

paucidens De Haan, 1841. Synonym: *Leander paucidens* Stimpson, 1860. Distribution: S. Siberia, China, Japan. Fresh, brackish and salt water. Vid. p. 70.

peruanus Holthuis, 1950. Distribution: N. Peru. In salt creeks.

ritteri Holmes, 1895. Synonym: *Leander ritteri* Nobili, 1901. Distribution: From California to Peru, Cocos Island and Galápagos Islands. Litoral form.

serratus (Pennant, 1777). Synonyms: *Astacus serratus* Pennant, 1777; *Melicerta Triliana* Risso, 1816; *Palaemon Trilianus* Risso, 1826; *Palaemon Treillianus* H. Milne Edwards, 1837; *Leander Latreillianus* (with vars. *intermedia* and *aberrans* and the forms *gigantea, typica* and *transitans,* and the monstrosity *sculpta*) Czerniavsky, 1884; *Leander serratus* Sharp, 1893; *Leander treillianus* Adensamer, 1898; *Leander serratus* var. *treillianus* De Man, 1915a; *Palaemon rostratus* Gimenez, 1922. Distribution: British Isles, Denmark, from Holland southwards to West Africa (Cap Blanc), Mediterranean, Black Sea. Litoral form. Vid. p. 90.

serrifer (Stimpson, 1860). Synonyms: *Leander serrifer* Stimpson, 1860; *Leander Fagei* Yu, 1930a; *Leander serrifer* var. *longidactylus* Yu, 1930a. Distribution: ? South Africa, Burma, Mergui Archipelago, Java, S. Siberia, China, Japan. Litoral form. Vid. p. 83.

sewelli (Kemp, 1925). Synonym: *Leander sewelli* Kemp, 1925. Distribution: Portuguese India, Bengal, Burma. Litoral form, generally in water of low salinity.

squilla (Linnaeus, 1758). Synonyms: *Cancer Squilla* Linnaeus, 1758; *Palaemon adspersus* Rathke, 1837; *Palaemon Fabricii* Rathke, 1843; *Palaemon rectirostris* Zaddach, 1844; *Palaemon Leachii* Bell, 1851; ? *Palaemon imbellis* Fischer, 1872; *Palaemon rectirostris* var. *octodentata* Neumann, 1878; *Leander rectirostris* (with var. *transitans* and forma *typica*) Czerniavsky, 1884; ? *Leander Brandti* Czerniavsky, 1884; *Leander adspersus* Ortmann, 1890; ? *Palaemon* (*Leander*) *Brandti* Thallwitz, 1892; *Leander adspersus* var. *fabricii* De Man, 1915a; *Leander rectirostris* var. *octodentatus* Bolivar, 1916; ?*Leander imbellis* Kemp, 1925. Distribution: British Isles, Baltic Sea, from westcoast of Norway to Mediterranean and Black Sea. Litoral form. Vid. p. 87.

xiphias Risso, 1826. Synonym: *Leander xiphias* Ortmann, 1890. Distribution: Mediterranean. Litoral form.

Subgenus **Palaeander** nov.

Type: *Palaemon elegans* Rathke

elegans Rathke, 1837. Synonyms: *Palaemon minans* Norman, 1861; *Palaemonella gracilis* Paulson, 1875; *Leander squilla* (with var. *prototypa* and *brevidigitata,* and forma *typica*) Czerniavsky, 1884 (non *Cancer Squilla* Linnaeus, 1758); *Palaemon* (*Leander?*) *minans* Thallwitz, 1892; *Leander squilla elegans* De Man, 1915a; *Leander squilla intermedia* De Man, 1915a; *Leander squilla typica* Höglund, 1943. Distribution: British Isles, from W. Norway and Denmark southwards to S. W. Africa, the Mediterranean and Black Sea, ?Red Sea. Litoral form. Vid. p. 55.

floridanus Chace, 1942. Distribution: Westcoast of Florida. Litoral form.

maculatus (Thallwitz, 1892). Synonym: *Leander maculatus* Thallwitz, 1892. Distribution: West Africa from Liberia to N. Angola. In sea and brackish water.

northropi (Rankin, 1898). Synonyms: *Leander northropi* Rankin, 1898; *Palaemon brachylabis* Rathbun, 1900. Distribution: E. American coast from Florida to Uruguay, Bermudas, West Indies.

semmelinkii (De Man, 1881). Synonym: *Leander semmelinkii* De Man, 1881. Distribution: West- and eastcoast of India, Burma, Malay Archipelago. Litoral form. Vid. p. 57.

Subgenus **Nematopalaemon** nov.

Type: *Leander tenuipes* Henderson

hastatus Aurivilius, 1898. Synonym: *Leander hastatus* Balss, 1916. Distribution: West Africa from French Guinea to Angola. Litoral form.

schmitti Holthuis, 1950. Distribution: Dutch Guiana. Brackish water.

tenuipes (Henderson, 1893). Synonyms: *Leander tenuipes* Henderson, 1893; *Palaemon luzonensis* Blanco, 1939. Distribution: Somaliland?, India, Burma, Luzon, New Zealand. Litoral form, brackish and salt water. Vid. p. 44.

Subgenus **Exopalaemon** nov.

Type: *Palaemon styliferus* H. Milne Edwards

annandalei (Kemp, 1917). Synonyms: *Leander annandalei* Kemp, 1917; *Leander annandalei stylirostris* Yu, 1930; *Leander stylirostris* Kubo, 1942. Distribution: China, Korea. Fresh water. Vid. p. 46.

carinicauda nom. nov. Synonyms: *Leander longirostris* var. *carinatus* Ortmann, 1890; *Leander carinatus* Doflein, 1902; *Palaemon* (*Leander*) *carinatus* Gee, 1925 (non *Palaemon carinatus* Olivier, 1811). Distribution: China, Korea, Singapore. Vid. p. 48.

macrogenitus (Yu, 1930a). Synonym: *Leander macrogenitus* Yu, 1930a. Distribution: Hangchow. Vid. p. 50.

mani (Sollaud, 1914). Synonym: *Leander Mani* Sollaud, 1914. Distribution: Tonkin.

modestus (Heller, 1862a). Synonyms: *Leander modestus* Heller, 1862a; *Leander czerniavskyi* Brashnikov, 1907; *Leander modestus sibirica* (Czerniavsky MSS) Brashnikov, 1907; *Leander czerniavskyi lacustris* Buldovsky, 1933. Distribution: E. Siberia, China, Formosa. Fresh water. Vid. p. 51.

orientis nom. nov. Synonyms: *Leander longirostris japonicus* Ortmann, 1890; *Palaemon japonicus* Rathbun, 1902b (non De Haan, 1849); *Leander japonicus* Balss, 1914. Distribution: Japan, China, Formosa. Vid. p. 49.

styliferus H. Milne Edwards, 1840. Synonym: *Palaemon longirostris* H. Milne Edwards, 1837, p. 394 (non H. Milne Edwards, 1837, p. 392); *Leander styliferus* Kemp, 1915. Distribution: From westcoast of India to Siam, Borneo and Java. Litoral form also in brackish and fresh waters. Vid. p. 46.

Palaemonetes Heller, 1869

Subgenus **Palaemonetes** Heller, 1869

Synonyms: *Palaemonopsis* Stimpson, 1871; *Allocaris* Sollaud, 1911; *Coutierella* Sollaud, 1914. Type: *Palaemon varians* Leach

africanus Balss, 1916. Distribution: Westcoast of Africa (Nigeria).

antennarius (H. Milne Edwards, 1837). Synonyms: *Palaemon antennarius* H. Milne Edwards, 1837; *Palaemon lacustris* Von Martens, 1857; *Pelias migratorius* Heller, 1862; *Anchistia migratoria* Heller, 1863; *Palaemon palustris* Tamarelli, 1864 (err. pro *lacustris*); *Palaemon fluviatilis* Heer, 1865 (err. pro *lacustris*); *Anchistia lacustris* Heller, 1866; *Palaemon varians termajophilus* Garbini, 1881;? *Leander antennarius* Czerniavsky, 1884; *Palaemonetes varians macrogenitor* Boas, 1889; *Palaemon* (*Palaemonetes*) *lacustris* Thallwitz, 1892; *Palaemon* (*Palaemonetes*) *palustris* Thallwitz, 1892; *Periclimenes migratorius* Pesta, 1912; *Palaemonetes varians thermaiophilus* Seurat, 1922; *Palaemonetes varians lacustris* Sollaud, 1923. Distribution: Italy, the Balkans and Syria. Fresh water.

argentinus Nobili, 1901d. Synonyms: *Leander brasiliensis* Ortmann, 1890; *Palaemon* (*Leander*) *brasiliensis* Thallwitz, 1892 (non Heller, 1862). Distribution: Eastern South America from S. Brazil to N. Argentina. In fresh water.

australis Dakin, 1915. Distribution: West Australia. Fresh water.

carteri Gordon, 1935. Distribution: Venezuela and British, Dutch and French Guiana. Fresh water.

hiltoni Schmitt, 1921. Distribution: S. California, N.W. Mexico.

intermedius Holthuis, 1949. Distribution: Atlantic coast of North America from Massachusetts to Texas. Brackish water.

ivonicus Holthuis, 1950. Distribution: N. Bolivia (Amazon basin). Fresh water.

kadiakensis Rathbun, 1902a. Distribution: Central North America, between the Great Lakes and the Gulf of Mexico, west of the Alleghenies and east of the continental divide; ? Alaska. Fresh water.

mesogenitor Sollaud, 1912. Synonyms: *Palaemonetes varians mesogenitor* Sollaud, 1912; *Palaemonetes punicus* Sollaud, 1924. Distribution: Tunisia and Algeria. Fresh water.

mesopotamicus Pesta, 1913. Synonym: *Palaemonetes varians mesopotamicus* Pesta, 1913. Distribution: Mesopotamia. Fresh water.

paludosus (Gibbes, 1850). Synonyms: *Hippolyte caroliniana* Gibbes, 1848 (nom. nud.); *Hippolyte paludosa* Gibbes, 1850; *Palaemonetes exilipes* Stimpson, 1871; *Palaemonopsis exilipes* Stimpson, 1871; *Hippolysmata paludosa* Howard, 1883; *Palaemon* (*Palaemonetes*) *exilipes* Thallwitz, 1892; *Palaemon* (*Palaemonetes*) *paludosus* Thallwitz, 1892. Distribution: U.S.A., east of the Alleghenies, from New Jersey to Florida. Fresh water.

pugio Holthuis, 1949. Distribution: Atlantic coast of N. America from Massachusetts to Texas. Brackish to almost fresh water.

schmitti Holthuis, 1950. Distribution: W. Panama and Canal Zone. Marine.

sinensis (Sollaud, 1911). Synonyms: *Allocaris sinensis* Sollaud, 1911: *Palaemonetes chankensis* Buldovsky, 1933; *Palaemonetes venephicus* Birstein & Vinogradov, 1934. Distribution: S.E. Siberia, China. Fresh water. Vid. p. 91.

tonkinensis (Sollaud, 1914). Synonym: *Coutierella tonkinensis* Sollaud, 1914. Distribution: Tonkin. Fresh water.

varians (Leach, 1814). Synonyms: ? *Astacus albescens* Pennant, 1812; *Palaemon varians* Leach, 1814; *Palaemon variabilis* Bouchard-Chantereaux, 1829; ? *Leander varians* Czerniavsky, 1884; *Palaemonetes varians microgenitor* Boas, 1889; *Palaemonetes varians occidentalis* Sollaud, 1923. Distribution: W. Baltic and North Sea southwards to the westcoast of Morocco, northcoast of N.W. Africa to Tunisia. Brackish waters.

vulgaris (Say, 1818). Synonyms: *Palaemon vulgaris* Say, 1818; *Palaemonopsis vulgaris* Stimpson, 1871; *Palaemonetes carolinus* Stimpson, 1871; *Palaemonopsis carolinus* Stimpson, 1871; ? *Palaemon* (*Leander*) *vulgaris* Von Martens, 1872; *Palaemon* (*Palaemonetes*) *carolinus* Thallwitz, 1892. Distribution: Atlantic coast of North America from Massachusetts to Texas (records from New Brunswick and Nova Scotia need confirmation). Brackish water.

zariquieyi Sollaud, 1939. Distribution: Gulf of Valencia, Spain. Slightly brackish water.

Subgenus **Alaocaris** Holthuis, 1949

Type: *Palaemonetes antrorum* Benedict

antrorum Benedict, 1896. Distribution: Texas. Fresh subterranean water.

Troglocubanus Holthuis, 1949

Type: *Palaemonetes eigenmanni* Hay

calcis (Rathbun, 1912). Synonym: *Palaemonetes calcis* Rathbun, 1912. Distribution: Havana Province, Cuba. Fresh water in cave.

eigenmanni (Hay, 1903). Synonym: *Palaemonetes eigenmanni* Hay, 1903. Distribution: Havana and Pinar del Rio Provinces, Cuba. Fresh water in caves.

gibarensis (Chace, 1943). Synonym: *Palaemonetes gibarensis* Chace, 1943. Distribution: Oriente Province, Cuba. Fresh water in cave.

inermis (Chace, 1943). Synonym: *Palaemonetes inermis* Chace, 1943. Distribution: Havana Province, Cuba. Fresh water in cave.

Leptocarpus nov. gen.

Type: *Leander fluminicola* Kemp

fluminicola (Kemp, 1917). Synonym: *Leander fluminicola* Kemp, 1917. Distribution: India, Burma. Fresh and slightly brackish water. Vid. p. 96.

potamiscus (Kemp, 1917). Synonyms: *Leander potamiscus* Kemp, 1917; *Palaemon potamiscus* Suvatti, 1937. Distribution: India, Andamans, Malay Peninsula, Siam, Malay Archipelago. Fresh, brackish and (?) salt water. Vid. p. 97.

Cryphiops Dana, 1852

Synonym: *Bithynis* Philippi, 1860

Type: *Cryphiops spinuloso-manus* Dana

caementarius (Molina, 1782). Synonyms: *Cancer caementarius* Molina, 1782; *Palaemon caementarius* Poeppig, 1836; *Palaemon Gaudichaudii* H. Milne Edwards, 1837; *Cryphiops spinuloso-manus* Dana, 1852; *Bithynis longimana* Philippi, 1860; *Macrobrachium africanum* Bate, 1868a; *Palaemon africanus* Thallwitz, 1892. Distribution: Peru and Chile. Fresh water. Vid. p. 98.

Pseudopalaemon Sollaud, 1911 b

Type: *Pseudopalaemon bouvieri* Sollaud

bouvieri Sollaud, 1911b. Synonym: *Pseudopalaemon iheringi* Sollaud, 1911c. Distribution: Brazil?, Uruguay. Fresh water.

Brachycarpus Bate, 1888

Synonym: *Calmania* Nobili, 1907a

Type: *Brachycarpus savignyi* Bate

biunguiculatus (Lucas, 1849). Synonyms: *Palaemon biunguiculatus* Lucas, 1849; *Brachycarpus savignyi* Bate, 1888; *Brachycarpus neapolitanus* Cano, 1890; *Palaemon savignyi* Ortmann, 1891; *Bithynis savignyi* Rathbun, 1902; *Brachycarpus advena* Nobili, 1905b; *Calmania biunguiculata* Nobili, 1907a; *Palaemonella rathbunensis* Borradaile, 1917; *Macrobrachium savignyi* Rathbun, 1919. Distribution: Western Mediterranean, Liberia, Atlantic coast of America from N. Carolina to Venezuela, Bermudas, Bahamas, West Indies, westcoast of America from Mexico to Colombia, Clipperton Island, Cocos Island and Galápagos Islands, ? Red Sea, Ceylon, Hawaiian Islands. Marine.

Macrobrachium Bate, 1868

Synonyms: *Eupalaemon* Ortmann, 1891; *Parapalaemon* Ortmann, 1891; *Macroterocheir* Stebbing, 1908.

Type: *Macrobrachium americanum* Bate

acanthurus (Wiegmann, 1836). Synonyms: *Palaemon acanthurus* Wiegmann, 1836; *Palemon forceps* H. Milne Edwards, 1837; *Palaemon Swainsonii* (Leach MSS) White, 1847; *Palaemon mexicanus* De Saussure, 1857; *Macrobrachium longidigitum* Bate, 1868a; *Palaemon dasydactylus* Streets, 1871; *Palaemon sexdentatus* Streets, 1871; *Palaemon longidigitum* Ortmann, 1891; *Palaemon Potieté* Müller, 1892; *Bithynis acanthurus* Rathbun, 1900; *Bithynis forceps* Young, 1900; *Palaemon* (*Eupalaemon*) *acanthurus* Nobili, 1901. Distribution: East American coast from Georgia to S. Brazil, West Indies. Fresh and brackish water.

aemulum (Nobili, 1906a). Synonyms: *Palaemon* (*Parapalaemon*) *aemulus* Nobili, 1906a; *Palaemon nobilii* Henderson & Matthai, 1910. Distribution: S. India, New Caledonia, Tuamotu Islands. Fresh water. Vid. p. 135.

altifrons (Henderson, 1893). Synonym: *Palaemon altifrons* Henderson, 1893. Distribution: North India. Fresh water. Vid. p. 196.

amazonicum (Heller, 1862). Synonyms: *Palaemon amazonicus* Heller, 1862; *Palaemon ensiculus* Smith, 1869; *Palaemon Dieperinkii* (De Haan MSS) De Man, 1879; *Bithynis lamarrei* Young, 1900; *Bithynis ensiculus* Young, 1900; *Bithynis amazonicus* Moreira, 1912. Distribution: Eastern part of S. America, from Venezuela to N. Paraguay. In rivers emptying in the Atlantic Ocean. Fresh water.

americanum Bate, 1868a. Synonym: *Palaemon americanus* Thallwitz, 1892; *Palaemon* (*Brachycarpus*) *jamaicensis* Nobili, 1901b (non *Cancer* (*Astacus*) *jamaicensis* Herbst, 1792). Distribution: Western America from Lower California to N. Peru, Cocos Island, Galápagos Islands. Fresh water.

asperulum (Von Martens, 1868). Synonyms: *Palaemon asperulus* Von Martens, 1868; *Palaemon* (*Parapalaemon*) *asperulus* De Man, 1904; *Palaemon asperulus brevirostris* Yu, 1931. Distribution: S.E. Siberia to S. China and Formosa. Fresh water. Vid. p. 193.

australe (Guérin Méneville, 1838). Synonyms: *Palaemon australis* Guérin Méneville, 1838; *Palaemon sundaicus* Heller, 1862; *Palaemon Danae* Heller, 1865; *Palaemon dispar* Von Martens, 1868; *Palaemon alphonsianus* Hoffmann,1874; *Palaemon parvus* Hoffmann, 1874; *Palaemon Mal-*

liardi Richters, 1880; *Palaemon* (*Eupalaemon*) *dispar* De Man, 1893; *Palaemon* (*Eupalaemon*) *ustulatus* Nobili, 1899; *Leander lepidus* De Man, 1915. Distribution: Indo-westpacific region from the Seychelles and Madagascar to the Malay Archipelago and Oceania. Fresh water. (Very young stages in brackish and salt water). Vid. p. 124.

australiense nom. nov. Synonyms: *Palaemon australis* Ortmann, 1891 (non Guérin Méneville, 1838); *Palaemon* (*Parapalaemon*) *australis* McNeill, 1929. Distribution: Australia (Northern Territory, Queensland, New S. Wales, S. Australia). Fresh water. Vid. p. 174.

bariense (De Man 1892). Synonym: *Palaemon* (*Macrobrachium*) *bariensis* De Man, 1892. Distribution: Eastern part of the Malay Archipelago: Celebes, Moluccas, Lesser Sunda Islands. Fresh water. Vid. p. 236.

borellii (Nobili, 1896). Synonym: *Palaemon Borellii* Nobili, 1896. Distribution: Uruguay, Argentina. Fresh water.

brasiliense (Heller, 1862). Synonyms: *Palaemon brasiliensis* Heller, 1862; *Palaemon appuni aequatorialis* Ortmann, 1891; *Palaemon* (*Eupalaemon*) *Nattereri* Nobili, 1901b (non *Palaemon Nattereri* Heller, 1862). Distribution: Amazon basin in E. Colombia, E. Ecuador, N.E. Peru and W. Brazil, British and Dutch Guiana. Fresh water.

caledonicum (J. Roux, 1926). Synonym: *Palaemon* (*Macrobrachium*) *caledonicus* J. Roux, 1926. Distribution: New Caledonia. Fresh water. Vid. p. 123.

callirhoë (De Man, 1898a). Synonym: *Palaemon* (*Macrobrachium*) *callirhoë* De Man, 1898a. Distribution: Kapuas Basin, Central Borneo. Fresh water. Vid. p. 197.

carcinus (Linnaeus, 1758). Synonyms: *Cancer Carcinus* Linnaeus, 1758; *Astacus carcinus* Fabricius, 1775; *Cancer* (*Astacus*) *Jamaïcensis* Herbst, 1792; *Palaemon jamaicensis* Olivier, 1811; *Palaemon carcinus* Leach, 1815 (non Fabricius, 1798); *Palaemon brachydactylus* Wiegmann, 1836; *Palemon punctatus* Randall, 1839; *Palemon brevicarpus* De Haan, 1849; *Palaemon aztecus* De Saussure, 1857;? *Palaemon Montezumae* De Saussure, 1857; *Palaemon laminatus* (Gollmer MSS.)Von Martens, 1869; *Palaemon* (*Macrobrachion*) *Jamaicensis* Von Martens, 1872; *Bithynis jamaicensis* Pocock, 1889; *Bithynis aztecus* Young, 1900; ? *Bithynis montezumae* Young, 1900; *Palaemon ornatus* (Forns MSS.) Torralbas, 1917 (non Olivier, 1811); *Palaemon* (*Macroterocheir*) *jamaicensis* De Man, 1925; *Periclimenes portoricensis* Schmitt, 1933. Distribution: E. America from Florida to S. Brazil, West Indies. Fresh and brackish waters.

cavernicola (Kemp, 1924). Synonym: *Palaemon cavernicola* Kemp, 1924. Distribution: Assam. Fresh water, in cave. Vid. p. 205.

chevalieri (J. Roux, 1935a). Synonym: *Palaemon* (*Macrobrachium*) *chevalieri* J. Roux, 1935a. Distribution: Cape Verde Islands and Angola. Fresh water.

clymene (De Man, 1902). Synonym: *Palaemon* (*Macrobrachium*) *clymene* De Man, 1902. Distribution: Baram River, Sarawak. Fresh water. Vid. p. 210.

cowlesi nov. spec. Distribution: Luzon, Philippines. Fresh water. Vid. p. 257.

crenulatum Holthuis, 1950. Distribution: E. Panama, Venezuela, West Indies. Fresh water.

dayanum (Henderson, 1893). Synonym: *Palaemon Dayanus* Henderson, 1893. Distribution: North and Central India. Fresh water. Vid. p. 197.

digueti (Bouvier, 1895). Synonym: *Palemon Digueti* Bouvier, 1895. Distribution: Westcoast of America from Lower California to Ecuador. Fresh water.

dux (Lenz, 1910a). Synonyms: *Palaemon* (*Eupalaemon*) *dux* Lenz, 1910a; *Palaemon* (*Eupalaemon*)

Lenzii De Man, 1911; *Palaemon* (*Eupalaemon*) *dux congoensis* De Man, 1912; *Palaemon* (*Eupalaemon*) *dux tenuicarpus* De Man, 1925. Distribution: West Africa from Spanish Guinea to Belgian Congo. Fresh water.

equidens (Dana, 1852). Synonyms: *Palaemon equidens* Dana, 1852; *Palaemon* (*Eupalaemon*) *sundaicus* De Man, 1892 (non Heller, 1862); *Palaemon sundaicus bataviana* De Man, 1897; *Palaemon* (*Eupalaemon*) *sundaicus brachydactyla* Nobili, 1899; *Palaemon sundaicus De Mani* Nobili, 1899; *Palaemon* (*Eupalaemon*) *acanthosoma* Nobili, 1899; *Palaemon* (*Eupalaemon*) *sundaicus baramensis* De Man, 1902; *Palaemon* (*Eupalaemon*) *nasutus* Nobili, 1903a; *Palaemon sulcatus* Henderson & Matthai, 1910 (non Olivier 1811); *Bithynis* (*Eupalaemon*) *sundaicus* Rathbun, 1910; *Palaemon delagoae* Stebbing, 1915; *Urocaridella borradailei* Stebbing, 1923. Distribution: Indo-westpacific region from E. and S. Africa to S. China, the Riukiu Islands and the Malay Archipelago. Brackish waters. Vid. p. 162.

esculentum (Thallwitz, 1891). Synonyms: *Palaemon esculentus* Thallwitz, 1891; *Palaemon dulcis* Thallwitz, 1891. Distribution: N. Celebes. Vid. p. 257.

faustinum (De Saussure, 1857). Synonyms: *Palaemon Faustinus* De Saussure, 1857; *Palaemon* (*Macrobrachion*) *Faustinus* Von Martens, 1872; *Bithynis spinimanus* Pocock, 1889 (non *Palemon spinimanus* H. Milne Edwards, 1837); *Palaemon cubanus* (Guérin MSS) Sharp, 1893; *Bithynis faustinus* Rathbun, 1897. Distribution: West Indies. Fresh water.

felicinum Holthuis, in press. Distribution: W. Africa from the Gold Coast to Angola. Fresh water.

fluviale (Streets, 1871). Synonyms: *Palaemon fluviale* Streets, 1871; *Palaemon fluviatilis* Sharp, 1893. Distribution: Coatzacoalcos River, E. Mexico. Fresh water.

foai (Coutière, 1902). Synonym: *Palaemon* (*Eupalaemon*) *Foai* Coutière, 1902. Distribution: Congo. Fresh water.

formosense Bate, 1868a. Synonyms: *Palemon longipes* De Haan, 1849 (non Olivier, 1811); *Palaemon formosensis* Ortmann, 1891; *Palaemon* (*Eupalaemon*) *longipes* De Man, 1897; *Bithynis longipes* Rathbun, 1902b; *Macrobrachium longipes* Maki & Tsuchiya, 1923. Distribution: Japan, Riukiu Islands, Bonin Islands, Formosa, ? Seychelles. Fresh water. Vid. p. 156.

geron nov. spec. Distribution: Banka, Malay Archipelago. Vid. p. 258.

grandimanus (Randall, 1839). Synonyms: *Palemon grandimanus* Randall, 1839; *Palemon gracilimanus* Randall, 1839; *Palaemon acutirostris* Dana, 1852; *Bithynis grandimanus* Bate, 1888. Distribution: Hawaiian Islands. Fresh water. Vid. p. 230.

hainanense (Parisi, 1919). Synonyms: *Palaemon* (*Parapalaemon*) *hainanense* Parisi, 1919; *Palaemon similis* Yu, 1931. Distribution: S. China, Java. Fresh water. Vid. p. 158.

hancocki Holthuis, 1950. Distribution: W. America from Costa Rica to Colombia, Cocos Island, Galápagos Archipelago. Fresh water.

hendersoni (De Man, 1906). Synonyms: *Palaemon* (*Parapalaemon*) *Hendersoni* De Man, 1906; *Bithynis* (*Parapalaemon*) *hendersoni* Rathbun, 1910; *Palaemon yunnanensis* Yu, 1936. Distribution: N. India, Yunnan, Burma. Fresh water. Vid. p. 209.

heterochirus (Wiegmann, 1836). Synonyms: *Palaemon heterochirus* Wiegmann, 1836; *Palaemon Appuni* Von Martens, 1869; *Bithynis appuni* Pocock, 1889. Distribution: Eastern Central and South America from Mexico to S. Brazil, West Indies. Fresh water.

hildebrandti (Hilgendorf, 1893). Synonyms: *Bithynis ? hildebrandti* Hilgendorf, 1893; *Palaemon hildebrandti* Calman, 1913. Distribution: Madagascar. Fresh water. Vid. p. 176.

hirtimanus (Olivier, 1811). Synonyms: *Palaemon hirtimanus* Olivier, 1811; *Palaemon* (*Macrobrachium*) *lepidactyloides* De Man, 1892. Distribution: Réunion, Mauritius, Malay Archipelago, Fiji. Fresh water. Vid. p. 245.

horstii (De Man, 1892). Synonym: *Palaemon* (*Parapalaemon*) *Horstii* De Man, 1892; *Palaemon* (*Parapalaemon*) *horsti brevidigitus* J. Roux, 1930. Distribution: Celebes, Lesser Sunda Islands. Fresh water. Vid. p. 203.

idae (Heller, 1862). Synonyms: *Palaemon Idae* Heller, 1862; *Palaemon* (*Eupalaemon*) *idae* De Man, 1897; *Palaemon* (*Eupalaemon*) *ritsemae* De Man, 1897; *Palaemon* (*Eupalaemon*) *Idae subinermis* Nobili, 1899; *Palaemon* (*Eupalaemon*) *Mariae* Coutière, 1900; *Palaemon Idae inermis* Coutière, 1901 (lapsus for *Palaemon Idae subinermis*); *Palaemon* (*Eupalaemon*) *robustus* De Man, 1902. Distribution: Indo-westpacific region from the Seychelles and Madagascar to the Malay Archipelago and the Admiralty Islands. Fresh water. Vid. p. 142.

idella (Hilgendorf, 1898). Synonyms: *Palaemon* (*Eupalaemon*) *idae* var. *idella* Hilgendorf, 1898; *Palaemon* (*Eupalaemon*) *multidens* Coutière, 1900. Distribution: E. Africa, Madagascar, India. Fresh water. Vid. p. 146.

iheringi (Ortmann, 1897). Synonym: *Palaemon iheringi* Ortmann, 1897. Distribution: Rio de Janeiro and São Paulo States, Brazil. Fresh water.

inca Holthuis, 1950. Distribution: Ecuador and N. Peru. Fresh water.

insulare (Parisi, 1919). Synonym: *Palaemon* (*Parapalaemon*) *insularis* Parisi, 1919. Distribution: Formosa. Fresh water. Vid. p. 176.

jacobsoni nov. spec. Distribution: Simalur Island, off W. Sumatra. Fresh water. Vid. p. 227.

japonicum (De Haan, 1849). Synonyms: *Palaemon japonicus* De Haan, 1849; *Palaemon boninensis* Stimpson, 1860; *Palaemon* (*Parapalaemon*) *japonicus* De Man, 1892. Distribution: Japan, Formosa, Bonin Islands, Riukiu Islands. Fresh water. Vid. p. 200.

jaroense (Cowles, 1914). Synonym: *Palaemon jaroensis* Cowles, 1914. Distribution: Leyte, Philippines. Fresh water. Vid. p. 205.

javanicum (Heller, 1862). Synonym: *Palaemon javanicus* Heller, 1862; *Palaemon* (*Parapalaemon*) *javanicus* De Man, 1892; *Palaemon* (*Eupalaemon*) *neglectus* De Man, 1905; *Macrobrachium neglectus* Suvatti, 1937. Distribution: Siam, Malay Peninsula, Mergui Archipelago, Sumatra, Java, ? Borneo, Celebes. Fresh water. Vid. p. 190.

jelskii (Miers, 1877). Synonyms: *Palaemon jelskii* Miers, 1877; *Bithynis jelskii* Young, 1900. Distribution: Trinidad, Venezuela, Dutch and French Guiana. Fresh water.

joppae nov. spec. Distribution: Nias, off W. Sumatra. Vid. p. 233.

kiukianense (Yu, 1931). Synonym: *Palaemon kiukianensis* Yu, 1931. Distribution: Central China. Fresh water. Vid. p. 196.

lamarrei (H. Milne Edwards, 1837). Synonyms: *Palemon Lamarrei* H. Milne Edwards, 1837; *Palaemonetes lamarrei* Arndt, 1933. Distribution: India, Ganges delta to Chilka lake. Fresh and brackish waters. Vid. p. 119.

lanceifrons (Dana, 1852). Synonym: *Palaemon lanceifrons* Dana, 1852. Distribution: Luzon, Philippines. Fresh water. Vid. p. 154.

lanceifrons ssp. *montalbanense* (Cowles, 1914). Synonym: *Palaemon lanceifrons montalbanensis* Cowles, 1914. Distribution: Luzon, Philippines. Fresh water. Vid. p. 154.

lanchesteri (De Man, 1911). Synonyms: *Palaemon paucidens* Lanchester, 1901 (non De Haan, 1841);

Palaemon (*Eupalaemon*) *Lanchesteri* (De Man, 1911). Distribution: Siam, Malay Peninsula. Fresh water. Vid. p. 139.

lar (Fabricius, 1798). Synonyms: *Palaemon Lar* Fabricius, 1798; ? *Palaemon longimanus* Fabricius, 1798; *Palaemon ornatus* Olivier, 1811; *Palaemon tridens* (Leach MSS) White, 1847; *Palaemon vagus* Heller, 1862; *Palaemon spectabilis* Heller, 1862a; *Palaemon ruber* Hess, 1865; *Palaemon mayottensis* Hoffmann, 1874; *Palaemon reunionnensis* Hoffmann, 1874; *Palaemon longimanus* Hoffmann, 1874; *Palaemon madagascariensis* Hoffman, 1874; *Bithynis lar* Bate, 1888; *Palaemon ornatus vagus* De Man, 1888; *Palaemon* (*Eupalaemon*) *lar* De Man, 1892; *Palaemon* (*Eupalaemon*) *vagus* Nobili, 1899; *Palaemon* (*Eupalaemon*) *reunionnensis* De Man, 1905; *Leander dionyx* Nobili, 1905. Distribution: Indo-westpacific region from E. Africa to the Riukiu Islands and the Marquesas. Fresh water. (Very young specimens in brackish and salt water). Vid. p. 176.

latidactylus (Thallwitz, 1891). Synonyms: *Palaemon latidactylus* Thallwitz, 1891; *Palaemon* (*Eupalaemon*) *endehensis* De Man, 1892; *Palaemon* (*Macrobrachium*) *lampropus* De Man, 1892. Distribution: Malay Peninsula, Malay Archipelago. Fresh water. Vid. p. 239.

latimanus (Von Martens, 1868). Synonyms: *Palaemon latimanus* Von Martens, 1868; *Palaemon eurythynchus* Ortmann, 1891; *Palaemon* (*Macrobrachium*) *singalangensis* Nobili, 1900. Distribution: Riukiu Islands, Malay Archipelago to the Marquesas. Fresh water. Vid. p. 205.

lepidactylus (Hilgendorf, 1879). Synonyms: *Palaemon lepidactylus* Hilgendorf, 1879; *Palaemon* (*Macrobrachium*) *Hilgendorfi* Coutière, 1899; *Macroterocheir lepidactylus* Stebbing, 1908. Distribution: E. and S.E. Africa and Madagascar. Fresh water. Vid. p. 244.

lorentzi (J. Roux, 1921). Synonym: *Palaemon* (*Parapalaemon*) *lorentzi* J. Roux, 1921. Distribution: S.W. New Guinea. Fresh water. Vid. p. 213.

lujae (De Man, 1912). Synonym: *Palaemon* (*Parapalaemon*) *Lujae* De Man, 1912. Distribution: Belgian Congo. Fresh water.

macrobrachion (Herklots, 1851). Synonyms: *Palaemon macrobrachion* Herklots, 1851; *Palaemon africanus* Kingsley, 1882; *Palaemon* (*Eupalaemon*) *macrobrachion* De Man, 1904. Distribution: West Africa from French Guinea to Angola. Fresh and brackish waters.

malcolmsonii (H. Milne Edwards, 1844). Synonyms: *Palemon Malcolmsonii* H. Milne Edwards, 1844; *Palaemon spinipes Birmanicus* Schenkel, 1902. Distribution: India, Burma. Fresh and salt waters. Vid. p. 121.

mammillodactylus (Thallwitz, 1892). Synonyms: *Palaemon idae mammillodactylus* Thallwitz, 1892; *Palaemon* (*Eupalaemon*) *Wolterstorffi* Nobili, 1900; *Palaemon philippinensis* Cowles, 1914; *Palaemon* (*Eupalaemon*) *philippinensis* J. Roux, 1921; ? *Palaemon talaverae* Blanco, 1939. Distribution: Riukiu Islands, Philippines, N. Celebes, Talaud Islands, Waigeo, New Guinea, ? Java. Fresh water. Vid. p. 148.

minutum (J. Roux, 1917). Synonym: *Palaemon minutus* J. Roux, 1917. Distribution: Sentani Lake, N. New Guinea. Fresh water. Vid. p. 140.

mirabile (Kemp, 1917). Synonym: *Palaemon mirabilis* Kemp, 1917. Distribution: Gangetic delta, Burma, Siam, Borneo. Brackish water. Vid. p. 174.

moorei (Calman, 1899). Synonym: *Palaemon moorei* Calman, 1899. Distribution: Tanganyika Lake. Fresh water. Vid. p. 197.

naso (Kemp, 1918). Synonym: *Palaemon naso* Kemp, 1918. Distribution: Inlé Lake, Central Burma. Fresh water. Vid. p. 136.

nattereri (Heller, 1862). Synonyms: *Palaemon Nattereri* Heller, 1862; *Bithynis brasiliensis* Young, 1900 (non *Palaemon brasiliensis* Heller, 1862); *Bithynis nattereri* Young, 1900. Distribution: French Guiana, Amazon basin in N. Brazil. Fresh water.

niloticum (P. Roux, 1833). Synonyms: *Palaemon Niloticus* P. Roux, 1833; *Palaemon niloticus* Klunzinger, 1866; *Palaemon* (*Eupalaemon*) *niloticus* J. Roux, 1928. Distribution: Nile River, Lake Rudolf, Lake Chad. Fresh water. Vid. p. 197.

nipponense (De Haan, 1849). Synonyms: *Palemon nipponensis* De Haan, 1849; *Palaemon asper* Stimpson, 1860 (non L a t r e i l l e, 1818); *Palaemon sinensis* Heller, 1862a; *Bithynis nipponensis* Rathbun, 1902b; *Palaemon* (*Eupalaemon*) *nipponensis* Parisi, 1919. Distribution: China, Japan, Formosa. Fresh water. Vid. p. 172.

novae-hollandiae (De Man, 1908). Synonym: *Palaemon* (*Eupalaemon*) *novae-hollandiae* De Man, 1908. Distribution: Queensland, New South Wales, ? New Caledonia. Fresh water. Vid. p. 155.

occidentale Holthuis, 1950. Distribution: W. America from Guatemala to S. Panama. Fresh water.

oenone (De Man, 1902). Synonyms: *Palaemon* (*Macrobrachium*) *oenone* De Man, 1902; *Palaemon* (*Macrobrachium*) *oenone papuana* J. Roux, 1927. Distribution: Halmahera, New Guinea. Fresh water. Vid. p. 256.

ohione (Smith, 1874). Synonyms: *Palaemon Ohionis* Smith, 1874; *Palaemon ohioensis* Sharp, 1893; *Bithynis ohionis* Cary & Spaulding, 1909. Distribution: United States of America (N. Carolina, S. Carolina, Georgia, Mississippi, Arkansas, Louisiana, Illinois, Missouri, Indiana, Oklahoma, Texas). Fresh water.

olfersii (Wiegmann, 1836). Synonyms: *Astacus Serratus* Meuschen, 1781 (non Pennant, 1777); *Palaemon Olfersii* Wiegmann, 1836; *Palemon spinimanus* H. Milne Edwards, 1837 (non Latreille, 1818); *Palaemon consobrinus* De Saussure, 1857; *Palaemon Desausuri* Heller, 1862; *Palaemon potiporanga* Müller, 1892; *Bithynis olfersii* Rathbun, 1902. Distribution: Eastcoast of America from S. Mexico to S. Brazil, Florida. Fresh water.

palaemonoides nov. spec. Distribution: Simalur, off W. Sumatra. Fresh water. Vid. p. 136.

panamense Rathbun, 1912a. Synonym: *Macrobrachium acanthurus panamense* Rathbun, 1912a. Distribution: W. America from Honduras to Ecuador. Fresh water.

patsa (Coutière, 1900). Synonym: *Palaemon* (*Parapalaemon*) *Patsa* Coutière, 1900. Distribution: E. Africa, Madagascar. Fresh water. Vid. p. 210.

petersii (Hilgendorf, 1879). Synonyms: *Palaemon Petersii* Hilgendorf, 1879; *Palaemon* (*Parapalaemon*) *petersii* Weber, 1897. Distribution: S. E. Africa (Mozambique, Natal). Fresh water. Vid. p. 222.

petiti (J. Roux, 1934). Synonym: *Palaemon* (*Macrobrachium*) *petiti* J. Roux, 1934. Distribution: Madagascar. Fresh water. Vid. p. 198.

pilimanus (De Man, 1879). Synonyms: *Palaemon pilimanus* De Man, 1879; *Palaemon* (*Macrobrachium*) *pilimanus leptodactylus* De Man, 1892; *Palaemon* (*Macrobrachium*) *pygmaeus* J. Roux, 1928a; *Palaemon* (*Macrobrachium*) *pilimanus malayanus* J. Roux, 1935. Distribution: Malay Peninsula, Sumatra, Java, Borneo. Fresh water. Vid. p. 214.

placidulum (De Man, 1892). Synonyms: ? *Palaemon spinimanus* Latreille, 1818; *Palaemon* (*Macrobrachium*) *placidulus* De Man, 1892. Distribution: ? Nias, Lesser Sunda Islands, Celebes, Moluccas, New Guinea, New Hannover. Fresh water. Vid. p. 253.

placidum (De Man, 1892). Synonym: *Palaemon* (*Macrobrachium*) *placidus* De Man, 1892. Distribution: W. Sumatra, ? Java. Fresh water. Vid. p. 251.

potiuna (Müller, 1880). Synonym: *Palaemon Potiuna* Müller, 1880. Distribution: S.E. Brazil. Fresh water.

praecox (J. Roux, 1928). Synonym: *Palaemon* (*Eupalaemon*) *praecox* J. Roux, 1928. Distribution: Colombia, Venezuela. Fresh water.

quelchi (De Man, 1902b). Synonym: *Palaemon* (*Macrobrachium*) *quelchi* De Man, 1902b. Distribution: British Guiana. Fresh water.

raridens (Hilgendorf, 1893a). Synonyms: *Palaemon* (*Eupalaemon?*) *paucidens* Hilgendorf, 1893a, p. 155 (non De Haan, 1841); *Palaemon* (*Macrobrachium*) *raridens* Hilgendorf, 1893a, p. 181; *Bithynis paucidens* Rathbun, 1900a. Distribution: West Africa from French Guinea to Nigeria. Fresh water.

rathbunae Holthuis, 1950. Distribution: W. America from Panama to Ecuador. Fresh water.

rosenbergii (De Man, 1879). Synonyms: *Cancer* (*Astacus*) *Carcinus* Herbst, 1792 (non Linnaeus, 1758); *Palaemon Carcinus* Fabricius, 1798; *Palaemon Rosenbergii* De Man, 1879; *Palaemon carcinus rosenbergii* Ortmann, 1891; *Palaemon whitei* (Guérin MSS) Sharp, 1893; *Palaemon* (*Eupalaemon*) *Rosenbergi* Nobili, 1899; *Palaemon spinipes* Schenkel, 1902 (non Desmarest, 1817); *Palaemon d'Acqueti* Sunier, 1925. Distribution: India to S. China, the Malay Archipelago and N. Australia. Fresh, brackish and salt water. Vid. p. 111.

rude (Heller, 1862a). Synonyms: *Palaemon rudis* Heller, 1862a; *Palaemon Mossambicus* Hilgendorf, 1879; *Palaemon* (*Eupalaemon*) *rudis* Coutière, 1900; *Palaemon* (*Eupalaemon*) *Alcocki* Nobili, 1903. Distribution: E. Africa, Madagascar, India. Fresh water. Vid. p. 150.

scabriculum (Heller, 1862a). Synonyms: *Palaemon scabriculus* Heller, 1862a; *Palaemon dolichodactylus* Hilgendorf, 1879; *Palaemon* (*Parapalaemon*) *scabriculus* De Man, 1897; *Palaemon* (*Parapalaemon*) *dolichodactylus* Hilgendorf, 1898; *Palaemon dubius* Henderson & Matthai, 1910. Distribution: E. Africa, Madagascar, India, N. and W. Sumatra. Fresh water. Vid. p. 224.

sintangense (De Man, 1898a). Synonyms: *Palaemon* (*Eupalaemon*) *elegans* De Man, 1892 (non Rathke, 1837); *Palaemon* (*Eupalaemon*) *sintangensis* De Man, 1898a. Distribution: Malay Peninsula, Sumatra, Java, Borneo. Fresh water. Vid. p. 151.

sollaudii (De Man, 1912). Synonym: *Palaemon* (*Eupalaemon*) *Sollaudii* De Man, 1912. Distribution: West Africa from Cameroon to Belgian Congo. Fresh water.

sophronicum nom. nov. Synonyms: ? *Palaemon gracilirostris* Miers, 1875; *Palaemon* (*Parapalaemon*) *modestus* De Man, 1892 (non Heller, 1862); *Palaemon* (*Parapalaemon*) *modestus brevimanus* J. Roux, 1934a. Distribution: Riukiu Islands, Lesser Sunda Islands, Moluccas, New Ireland, ? Samoa. Fresh water. Vid. p. 198.

sulcicarpale nov. spec. Distribution: Salajar Islands near Celebes. Fresh water. Vid. p. 220.

superbum (Heller, 1862a). Synonym: *Palaemon superbus* Heller, 1862a. Distribution: China. Fresh water. Vid. p. 139.

surinamicum Holthuis, 1948. Distribution: Colombia (Atlantic drainage), British and Dutch Guiana. Fresh water.

tenellum (Smith, 1871). Synonyms: *Palaemon tenellus* Smith, 1871; *Palaemon longipes* Lockington, 1878 (non Olivier, 1811). Distribution: W. America from Lower California to N. Peru. Fresh water.

transandicum Holthuis, 1950. Distribution: W. Colombia. Fresh water.

trompii (De Man, 1898a). Synonyms: *Palaemon* (*Parapalaemon*) *Trompii* De Man, 1898a; *Palaemon*

(*Parapalaemon*) *thienemanni* J. Roux, 1932; *Palaemon* (*Parapalaemon*) *trompi armatus* J. Roux, 1936. Distribution: Malay Peninsula, Sumatra, Borneo. Fresh water. Vid. p. 211.

venustum (Parisi, 1919). Synonym: *Palaemon* (*Eupalaemon*) *venustus* Parisi, 1919. Distribution: S. China. Vid. p. 156.

vollenhovenii (Herklots, 1857). Synonyms: *Palaemon Vollenhovenii* Herklots, 1857; *Palaemon* (*Macrobrachium*) *vollenhoveni* Hilgendorf, 1893; *Palaemon jamaicensis africanus* Bouvier, 1895; *Palaemon jamaicensis Vollenhoveni* Aurivillius, 1898; *Bithynis jamaicensis vollenhovenii* Rathbun, 1900a; *Palaemon* (*Macrobrachium*) *jamaicensis angolensis* De Man, 1904; *Palaemon* (*Parapalaemon*) *Vollenhovenii* De Man, 1912; *Palaemon* (*Macroterocheir*) *jamaicensis Herklotsii* De Man, 1925. Distribution: Cape Verde Islands, West Africa from Senegal to Angola. Fresh water.

weberi (De Man, 1892). Synonym: *Palaemon* (*Eupalaemon*) *Weberi* De Man, 1892. Distribution: Celebes, New Guinea, New Britain. Fresh water. Vid. p. 122.

yui nom. nov. Synonym: *Palaemon brevicarpus heterochirus* Yu, 1936. Distribution: Yunnan. Fresh water. Vid. p. 211.

zariquieyi Holthuis, in press. Distribution: The islands Fernando Poo and São Thomé in the Gulf of Guinea, W. Africa.

Fossil Palaemonidae [1])

Homelys Von Meyer, 1862

Type: *Homelys minor* Von Meyer

minor Von Meyer, 1862. Synonym: *Homelys major* Heer, 1865; ? *Palaemon anophthalmus* Salter & Woodward, 1865 (non Kollar, 1848). Distribution: Switzerland, ? Czechoslovakia. Upper Miocene.

Micropsalis Von Meyer, 1859

Type: *Micropsalis papyracea* Von Meyer

?*bolcensis* Schauroth, 1865. Distribution: Italy. Lutetian.

papyracea Von Meyer, 1859. Synonym: *Palaemon bonnensis* Salter & Woodward, 1865. Distribution: W. Germany, Czechoslovakia. Oligocene.

Palaemon Fabricius, 1798

Type: *Cancer Squilla* Linnaeus

exul Frič, 1872. Distribution: Czechoslovakia. Upper Oligocene.

fabricii Michelotti, 1861 (non Rathke, 1843). Distribution: Italy. Lower Oligocene. The position of this species is rather doubtful.

mortuus Smirnov, 1929. Distribution: North Caucasus. Oligocene.

roemeri Von der Marck, 1858. Distribution: Westphalia. Senonian.

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1) The data concerning the fossil Palaemonidae for the larger part are derived from: GLAESSNER, M. F., 1929. Crustacea decapoda. In: Pompeckj, J. F., Fossilium Catalogus. I: Animalia, vol. 41, pp. 1-464.

Propalaemon Woodward, 1903

Type: *Propalaemon osborniensis* Woodward

minor Woodward, 1903. Distribution: Isle of Wight, England. Lower Oligocene.

osborniensis Woodward, 1903. Distribution: Isle of Wight, England. Lower Oligocene.

Species incertae:

Cancer (*Gammarellus*) *armiger* Herbst, 1793. Synonym: *Palaemon armiger* Olivier, 1811. According to the description and figure of Herbst this species is closely related to or identical with *Palaemon serratus* (Penn.), but no certainty can be obtained in this respect; moreover the locality from which the specimen originates is not known.

Hippolyte gracilipes Randall, 1839. Distribution: Hawaiian Islands. Randall's description is not sufficient to ascertain the identity of his material. According to Gibbes (1850) the specimen belongs to *Palaemon.*

Leander deschampsi Nobili, 1903a. Distribution: Singapore [1]).

Leander distans Heller, 1862a. Synonym: *Palaemon* (*Leander*) *distans* Thallwitz, 1892. Distribution: Nicobar Islands [1]).

Leander hammondi Kingsley, 1882. Synonym: *Palaemon* (*Leander*) *hammondi* Thallwitz, 1892. Distribution: Baker's Island, northern Pacific Ocean [1]).

Leander indicus Heller, 1862. Synonym: *Palaemon* (*Leander*) *indicus* Thallwitz, 1892. Distribution: Java. The description is insufficient to make certain in which genus the species has to be placed.

Leander intermedius Stimpson, 1860. Synonym: *Palaemon* (*Leander*) *intermedius* Miers, 1884. Distribution: S. Australia, Tasmania [1]).

Leander litoreus McCulloch, 1909. Distribution: Australia [1]).

Palaemon adriaticus Costa, 1832-1839. Distribution: Adriatic Sea. The description is insufficient. Possibly the species is identical with *Palaemon serratus* (Penn.).

Palaemon audouini Heller, 1861. Distribution: Red Sea. The identity of this species cannot be made out from the original description.

Palaemon brevimanus Fabricius, 1798. Distribution: East India. Fabricius's description is insufficient for the recognition of the species. The typespecimens of his *Palaemon* species are no longer extant, as the late Dr. K. Stephensen of the Copenhagen Museum kindly informed me.

Palaemon brevirostris Andrzeiowski, 1839. Synonym: *Leander brevirostris* Kemp, 1925. Distribution: Black Sea. The species is insufficiently described.

Palaemon (*Eupalaemon*) *cognatus* J. Roux, 1927. Distribution: Mamberamo River, North New Guinea. The species is based on a young specimen of a species of *Macrobrachium,* which probably belongs to the *idae* group. The specimen is too young, however, to give a correct idea of the status of the species to which it belongs. The specimens named by Roux (1934a) *Palaemon cognatus,* however, are *Macrobrachium idae.*

Palemon Cognetii Risso, 1816. Synonym: *Alpheus Cougneti* Risso, 1826. Distribution: Nice, France.

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1) Of these species the structure of the oral parts is not known, so that it is impossible to refer them with certainty to any of the Palaemonid genera. These species all are included in Kemp's (1925) key to the species of the genus "Leander" s.l.

The description is insufficient to recognize the species. It in all probability is no Palaemonid, but a Hippolytid prawn.

Palaemon coromandelianus Fabricius, 1798. Distribution: East India. The description is insufficient and the typespecimens are no longer extant.

Palemon crenulatus Risso, 1826. Distribution: Nice, France. The description is insufficient and mainly based on the colour. According to H. Milne Edwards (1837) this species is identical with *Palaemon xiphias* Risso.

Palaemon (*Macrobrachium*) *handschini* J. Roux, 1933a. Distribution: N. Australia. The description is not sufficient to make the systematic status of this species fully certain.

Palemon Margaritaceus Risso, 1816. Synonym: *Alpheus margaritaceus* Risso, 1826. Distribution: Nice, France. The description of the present species is not sufficient for recognition. It may be a species of Hippolytidae.

Palaemon parvulus Costa, 1832-1839. Distribution: Gulf of Napels. The description is insufficient; possibly the species is identical with *Palaemon serratus* (Penn.).

Palaemon parvus Olivier, 1811. Distribution: Mediterranean. The description is not sufficient for the recognition of the species.

Palaemon riukiuensis Kubo, 1940b. Distribution: Riukiu Islands. The specimens on which the description of this species is based, probably are not fullgrown, so that their identity with or distinctness from other species cannot be made certain.

Palaemon serratus (Fabricius, 1793) Fabricius, 1798. Synonym: *Astacus serratus Fabricius,* 1793 (non Pennant, 1777). Distribution: Norway. The description is too short to make it possible to recognize the species.

Palaemon (*Parapalaemon*) *stresemanni* J. Roux, 1918. Distribution: Bali, Malay Archipelago. The material on which this new species is based contains only 1 male specimen, this specimen is young and moreover lacks the second legs. Therefore too few characteristics are known of this species to make it possible to determine its place in the genus *Macrobrachium.*

Palaemon tranquebaricus Fabricius, 1798. Distribution: East India. The description is not sufficient to recognize the species. The typematerial is no longer extant.

Palaemon Trisetaceus Risso, 1816. Distribution: Nice, France. The description is insufficient.

†*Palaemon walchii* Holl, 1829. The description of this species is not at my disposal.

Nomina nuda:

Brachycarpus dentatus Nobili, 1907a. Cf. Kemp, 1925, p. 312, footnote.

Macrobrachium gangeticum Bate, 1868a. Distribution: Patna, near Calcutta.

Palaemon Abbotii (Leach MSS) White, 1847. Distribution: Georgia.

Palaemon aciculatus White, 1847. Distribution: unknown.

Palaemon Affinis (Costa MSS) Hope, 1851. Distribution: Napels, Italy.

Palemon amboinensis Bleeker, 1856. Distribution: Amboina, Malay Archipelago.

Palaemon Bipunctatus (Risso MSS) Hope, 1851. Distribution: Nice, France.

Palaemon Brasiliensis (Leach MSS) White, 1847. Distribution: Brazil.

Palemon Brongniartii Bleeker, 1856 (p. 64; as *Palaemon Br.* on p. 182). Distribution: Amboina and Saparua, Malay Archipelago.

Palaemon Colombicus White, 1847. Distribution: Colombia.

Palaemon Creusa White, 1847. Distribution: West Indies.
Palaemon Cydippe White, 1847. Distribution: Brazil.
Palaemon Delaserii (Geny MSS) Hope, 1851. Distribution: Nice, France.
Palemon Dumerilii Bleeker, 1856. Distribution: Amboina, Malay Archipelago.
Palemon Edwardsii Bleeker, 1856. Distribution: Amboina, Malay Archipelago.
Palaemon Electra White, 1847. Distribution: Brazil.
Palaemon fluvialis Bate, 1876. Distribution: Port Louis, Mauritius.
Palaemon gangeticum (Bate) Thallwitz, 1892 vid. *Macrobrachium gangeticum* Bate.
Palaemon Glauce White, 1847. Distribution: Philippine Islands.
Palaemon Hypsa White, 1847. Distribution: Brazil.
Palemon Inermis Roux, 1831. Distribution: ? Mediterranean.
Palaemon Latreillei (Leach MSS) White, 1847. Distribution: Brazil.
Palaemon macrorhynchos Bleeker, 1856. Distribution: Saparua, Malay Archipelago.
Palaemon Nicippe White, 1847. Distribution: West Africa.
Palemon Oratelli (Risso MSS) Monod, 1931. Distribution: Nice, France.
Palaemon Procles White, 1847. Distribution: Jamaica.
Palemon pusillum Rafinesque-Schmaltz, 1814. Distribution: Sicily.
Palaemon recticornis Sherborn, 1933. Probably an error for *P. rectirostris.*
Palaemon Siamensis Von Martens, 1868. Distribution: Siam.
Palemon Sogiontii (Risso MSS) Monod, 1931. Distribution: Nice, France.
Palaemon splendens Costa, 1840. Distribution: Mediterranean.
Palemon Vedianti (Risso MSS) Monod, 1931. Distribution: Nice, France.

Species incorrectly assigned to the Palaemoninae:

Brachycarpus audouini Bate, 1888 = *Periclimenes batei* nom. nov. Pontoniinae
Leander fluviatilis Thomson, 1879 = *Paratya curvirostris* (Heller, 1862) Atyidae
Leander pandaloides (Rathbun) Kemp, 1925 vid. *Palaemon pandaloides* Rathbun
Palaemon anophthalmus Kollar, 1848 = *Troglocaris anophthalmus* (Kollar) Atyidae
Palaemon asper Latreille, 1818 = *Stenopus hispidus* (Olivier, 1811) Stenopodidae
Palaemon audouini (Bate, 1888) Ortmann, 1891 (non Heller, 1861) = *Periclimenes batei* nom nov. Pontoniinae
Palaemon beaupresii Audouin, 1826 = *Harpiliopsis beaupresii* (Aud.) Pontoniinae
Palaemon bidens Olivier, 1811 = *Alpheus bidens* (Olivier) Alpheidae
Palaemon brevirostris Olivier, 1811 = *Alpheus brevirostris* (Olivier) Alpheidae
Palaemon canaliculatus Olivier, 1811 = *Penaeus canaliculatus* (Olivier) Penaeidae
Palaemon carinatus Olivier, 1811 = species of Penaeidae
Palaemon chlorotocus (A. Milne Edw. MSS) Filhol, 1885 = ? *Chlorotocus crassicornis* (Costa, 1871) Pandalidae
Palaemon custos (Forsskål, 1775) Latreille, 1802 = *Anchistus custos* (Forsskål) Pontoniinae
Palaemon dentatus De Haan, 1841 = *Lysmata dentata* (De Haan) Hippolytidae
† *Palaemon dentatus* Roemer, 1841 = *Hoploparia dentata* (Roemer) Nephropsidae
Palaemon diversimanus Olivier, 1811 = a species of Alpheidae

Palemon Ensiferus Risso, 1816 = *Ligur ensiferus* (Risso) Hippolytidae
Palaemon flavescens Olivier, 1811 = species incerta, but no Palaemonid (cf. H. Milne Edwards, 1837, p. 401)
Palaemon (*Leander*) *fluviatilis* (Thomson) Thallwitz, 1892 vid. *Leander fluviatilis* Thomson
Palaemon fucorum Fabricius, 1798 = *Latreutes fucorum* (Fabricius) Hippolytidae
Palaemon hispidus Olivier, 1811 = *Stenopus hispidus* (Olivier) Stenopodidae
Palaemon (*Brachycarpus*) *laccadivensis* (Alcock & Anderson, 1894) Alcock, 1901 = *Periclimenes laccadivensis* (Alc. & And.) Pontoniinae
Palemon Laevirhincus Risso, 1816 = *Athanas laevirhincus* (Risso) Alpheidae
Palaemon lancifer Olivier, 1811 = *Sicyonia lancifer* (Olivier) Penaeidae
Palaemon longicornis Olivier, 1811 = species of Penaeidae.
† *Palaemon longimanatus* (Schlotheim, 1820) Krueger, 1825 = *Mecochirus longimanatus* (Schlotheim) Glypheidae
Palaemon longipes Olivier, 1811 = *Stenopus hispidus* (Olivier) Stenopodidae
Palaemon marmoratus Olivier, 1811 = *Saron marmoratus* (Olivier) Hippolytidae
Palemon Microramphos Risso, 1816 = ? *Thoralus cranchii* (Leach, 1817) Hippolytidae
Palaemon Narval (Fabricius, 1787) Bosc, 1801 = *Parapandalus narval* (Fabricius) Pandalidae
Palaemon nitescens Leach, 1814 = *Athanas nitescens* (Leach) Alpheidae
Palaemon noctilucus Tilesius, 1818 = Decapod Larva ?
Palemon Olivieri Risso, 1816 = *Hippolyte inermis* Leach, 1814 Hippolytidae
Palaemon (*Palaemonella*) *orientalis* (Dana, 1852) Thallwitz, 1892 = *Palaemonella orientalis* Dana Pontoniinae
Palaemon pandaloides Rathbun, 1906 = *Bathypalaemonella pandaloides* (Rathbun) Campylonotidae
Palaemon pelasgicus Bosc, 1801 = *Hippolyte coerulescens* (Fabricius, 1781) Hippolytidae
Palaemon petitthouarsii Audouin, 1826 = *Periclimenes petitthouarsii* (Audouin) Pontoniinae
Palaemon pinnophylax Otto, 1821 = *Pontonia pinnophylax* (Otto) Pontoniinae
Palemon Pristis Risso, 1816 = *Parapandalus narval* (Fabricius, 1787) Pandalidae
Palaemon setiferus (Linnaeus, 1758) Olivier, 1811 = *Penaeus setiferus* (Linnaeus) Penaeidae
† *Palaemon spinipes* Desmarest, 1817 = *Aeger tipularius* (Schlotheim, 1822) Penaeidae
Palaemon spinosus Brullé, 1840 = *Oplophorus spinosus* (Brullé) Oplophoridae
Palaemon sulcatus Olivier, 1811 = *Penaeus kerathurus* (Forsskål, 1775) Penaeidae
Palaemon Tarentinum Costa, 1844 = *Parapandalus narval* (Fabricius, 1787) Pandalidae
† *Palaemon tenuicauda* Von der Marck, 1858 = *Pseudocrangon tenuicauda* (Von der Marck) Penaeidae
Palaemon (*Palaemonella*) *tenuipes* (Dana, 1852) Thallwitz, 1892 = *Palaemonella tenuipes* Dana Pontoniinae
Palaemon villosus Olivier, 1811 = *Alpheus villosus* (Olivier) Alpheidae

REPORT ON THE MATERIAL EXAMINED

Leander E. Desmarest, 1849

Definition: The body is slender and compressed. The rostrum is compressed, well developed and provided with teeth at both margins; the upper margin bears a single row of hairs, which are placed between the upper teeth of the rostrum, the lower portion of the rostrum bears two rows of

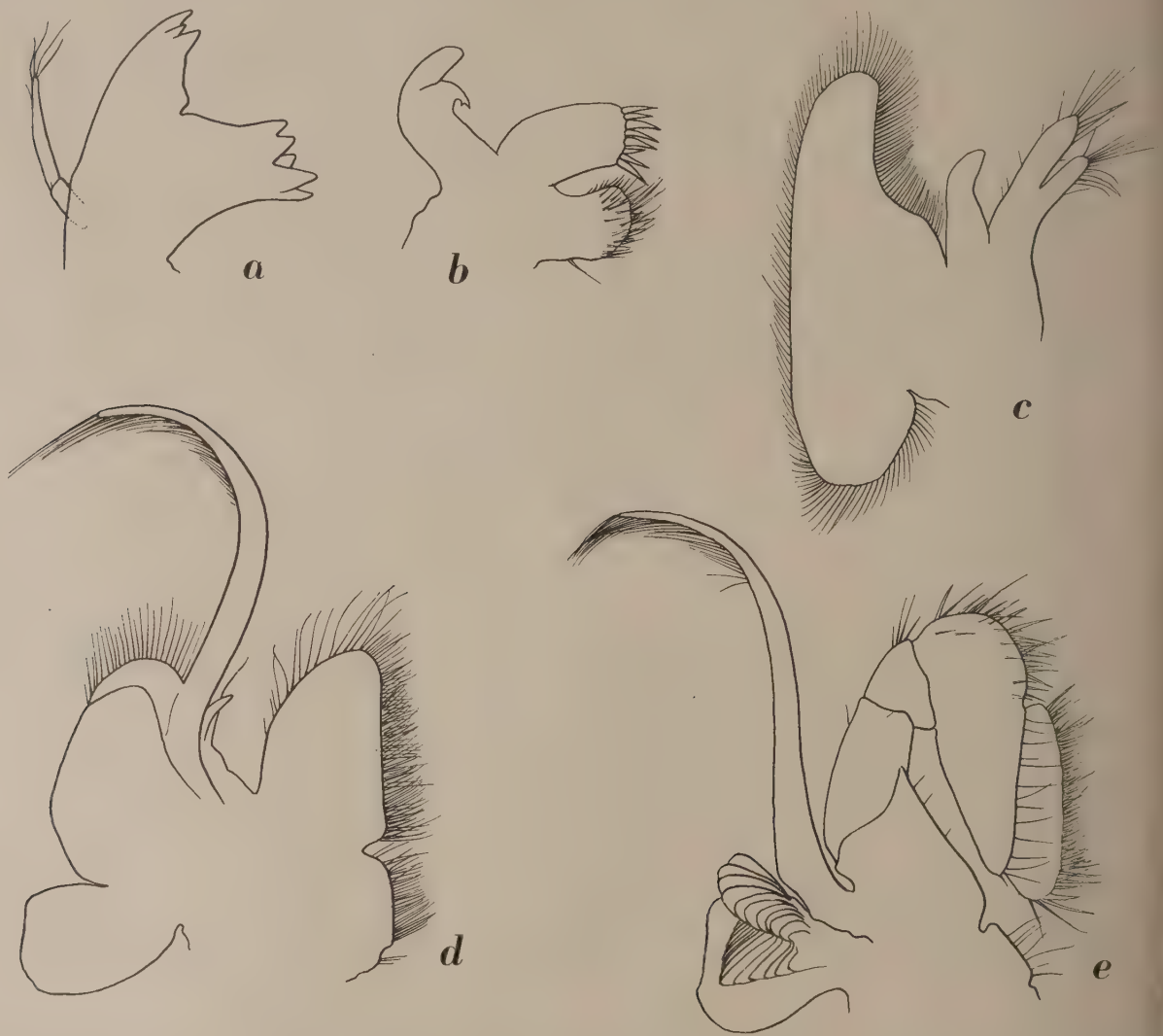

Fig. 1. *Leander tenuicornis* (Say). a, mandible; b, maxillula; c, maxilla; d, first maxillipede; e, second maxillipede. a-e, × 28.

hairs, which are directed ventrally and are inserted at each side of the rostrum above the bases of the ventral teeth: these hairs thereby cover the ventral teeth entirely. The carapace is smooth, it is provided with distinct antennal and branchiostegal spines. The branchiostegal spine is distinctly remote from the anterior margin of the carapace, the antennal spine is situated some distance below the rounded lower angle of the orbit and is placed on the anterior margin of the carapace. No

branchiostegal groove is present, though sometimes an indistinct shallow depression is visible on the carapace in the region where in the species of the genus *Palaemon* the branchiostegal groove is situated.

The abdomen is smooth. The pleurae of the first three segments are broadly rounded, those of the fourth and fifth segments are bluntly pointed, sometimes ending in a minute sharp tooth. The sixth segment is about one and a half time as long as the fifth. The pleurae of the sixth abdominal segment are very short and end in a sharp tooth, just like the posterolateral angles. The telson is elongate and slender, its dorsal surface is provided with two pairs of spines, while its posterior margin too bears two pairs of spines, between which two strong feathered setae are present; these setae sometimes are so strong, that they can better be described as setose spines.

The eyes are well developed, the cornea is hemisphaerical, it is broader and shorter than the stalk and is provided with a distinct ocellus.

The basal segment of the antennular peduncle is broad and is provided with a slender stylocerite, the anterolateral angle of the segment ends in a conspicuous spine. The second and third segments are slender. The upper flagellum is cleft and has the free part of the shorter ramus longer than the fused portion.

The scaphocerite is well developed, it ends in a distinct final tooth. The basal portion of the antennal peduncle bears a distinct external spine. The end of the antennal peduncle fails to reach the middle of the scaphocerite.

The mandible (fig. 1a) bears a two-jointed palp. The molar and incisor processes are well developed; the incisor process ends in three teeth, the molar process is provided in the distal part with blunt knobs and ridges, there are no spinules on the molar process. The maxillula (fig. 1b) has the inner lacinia slender, the upper lacinia bears some strong spines, the palp is distinctly cleft. The maxilla (fig. 1c) has the scaphognathite well developed, but not very broad, the palp is well developed, the inner lacinia is distinctly cleft. All maxillipedes are provided with distinct exopods. The epipod of the first maxillipede (fig. 1d) is bilobed, the caridean lobe of the exopod is well developed, the palp is distinct, the basis and coxa are separated by a distinct notch. The second maxillipede (fig. 1e) is normal in shape, the last joint is fused with the penultimate joint for its entire length, a podobranch is present, the epipod is well developed. The third maxillipede is elongate, and slender, the epipod is distinct, an arthrobranch as well as a pleurobranch are present.

The first pereiopods are slender and equal. The second pereiopods are slender though more heavilly build than the first pair; the fingers are elongate, the various joints unarmed. The last three pereiopods are equal in shape, they are slender and the dactylus is simple. The propodus of all three legs bears spines along the posterior margin, the propodus of the fifth pair lacks the transverse rows of hair, which are present in the species of *Palaemon*.

The first pleopod of the male has the endopod provided with an appendix interna, which is lacking in the female. The other pleopods are typical in shape. The uropods are elongate, they are longer than the telson, the outer margin of the exopod is straight and ends in two spines, the inner of which is movable; along the lower part of the outer margin of the exopod a longitudinal row of hairs is implanted.

Type species: *Leander erraticus* E. Desmarest

The genus consists of three species, which may be separated as follows:

1. Rostrum at most reaching slightly beyond the scaphocerite, generally not reaching the tip of that scale. Upper margin of the rostrum evenly toothed up to the apex. Rostrum straight 2
— Rostrum reaching far beyond the end of the scaphocerite; distal part of the upper margin of the rostrum entire, with the exception of two or three subapical teeth. Distal part of the rostrum strongly curved upwards . . . . . *urocaridella*

2. Pleurae of the fourth and fifth abdominal segments ending in a small but distinct tooth. Stylocerite large, reaching beyond the middle of the basal segment of the antennular peduncle . . . . . *tenuicornis*
— Pleurae of the fourth and fifth abdominal segments rounded at the apex. Stylocerite small, not reaching beyond the middle of the basal segment of the antennular peduncle . . . . . *kempi*

Leander tenuicornis (Say) (figs. 1, 2)

Siboga Expedition

Station 47, Bay of Bima, Sumbawa; reef; depth 55 m; bottom mud with patches of fine coral sand; April 8-12, 1899. — 3 specimens 21-29 mm.

Near Station 76, Makassar Strait, 4° 22'.1 S, 118° 16'.9 E; in Sargassum; June 9, 1899. — 1 specimen 25 mm.

Stations 204-208, Butung Strait, S. E. Celebes; among floating weeds; September 20-22, 1899. — 2 specimens 22 and 29 mm.

Station 230, Banda Sea, 3° 58' S, 128° 30' E; in Sargassum; November 14, 1899. — 1 specimen 24 mm.

Snellius Expedition

Makassar Strait, 4° 24'.5 S, 118° 47'.5 E; handnet; surface, between floating algae; August 2, 1929. — 3 specimens 10-23 mm.

Station 64, Sulu Sea, 7° 41'.0 N, 121° 01'.5 E; handnet; surface; September 6, 1929. — 4 specimens (including ovigerous females) 21-30 mm.

Sipankot near Sibutu, Sulu Islands; near the shore, between seagrass; September 11, 1929. — 1 specimen 20 mm.

Kera near Timor; depth 0-1 m; November 11-13, 1929. — 5 specimens 13-18 mm.

Station 330, Ceram Sea, 2° 22'.5 S, 128° 00'.5 E; September 8, 1930. — 13 specimens 8-11 mm.

Station 331, between Buru and S. Celebes, 3° 34'.0 S, 124° 20'.5 E; September 19, 1930. — 3 specimens 14-23 mm.

Station 363, W. of the Kai Islands, 6° 02'.0 S, 131° 52'.0 E; October 22, 1930. — 6 specimens 9-27 mm.

Museum Leiden

Japan (cotypes of *Palaemon latirostris* De Haan). — 5 specimens (including ovigerous females) 29-31 mm.

Muara Antjol, coast near Batavia; March 2, 1908; leg. E. Jacobson. — 1 specimen 32 mm.

Waigeo, off N. W. New Guinea; 1864; leg. H. A. Bernstein. — 1 specimen 31 mm.
Pacific Ocean; 1887; coll. Museum Godeffroy. — 3 specimens 22-31 mm.
Sargassum Sea, 29° N, 38° W; leg. Behrens. — 6 specimens 23-31 mm.
Northern Atlantic Ocean, 27° N, 42° 10′ W; in Sargassum; 1880; leg. L. R. Lusink. — 1 specimen 24 mm.
Sargassum Sea, 23° N, 35° W; 1879; leg. J. Kruisinga. — 1 specimen 38 mm.
Sargassum Sea; leg. Otke. — 1 ovigerous female 40 mm.
Sargassum Sea; 1879. — 9 specimens (including ovigerous female) 25-40 mm.
Curaçao, Rifwater; shallow water with algae; beam trawl; May 26, 1905; leg. J. Boeke. — 1 ovigerous female 36 mm.
Curaçao, Rifwater; shallow water; beam trawl; September 28, 1905; leg. J. Boeke. — 1 specimen 17 mm.
? Amsterdam. — 4 specimens (including ovigerous females) 30-37 mm.
Locality unknown. — 5 specimens (including ovigerous females) 34-37 mm.

Museum Amsterdam

Noordwachter Island, Java Sea; leg. J. Brock. — 1 ovigerous female 28 mm.
Banda; leg. E. van der Velde. — 1 ovigerous female 33 mm.
Atlantic Ocean, 30° N, 70° W; in Sargassum; April 14-16, 1896; coll. Yacht „Chazalie". — 70 specimens (including ovigerous females) 21-42 mm.
Atlantic Ocean, 26° 32′ N, 73° W; April 10, 1896; coll. Yacht "Chazalie". — 172 specimens (including ovigerous females) 9-36 mm.
Sargassum Sea; April 4, 1879; leg. J. Kruisinga. — 15 specimens 25-33 mm.
Gairaca, Santa Marta, Colombia; dredge; depth 0-15 m; February 29, 1896; coll. Yacht "Chazalie". — 1 specimen 19 mm.
Curaçao, Spaansche haven; April 10, 1920; leg. C. J. van der Horst. — 1 specimen 26 mm.
Curaçao, Spaansche water; May 25, 1920; leg. C. J. van der Horst. — 1 specimen 37 mm.
Locality unknown. — 23 specimens (9 ovigerous females) 27-40 mm.

A complete synonymy and a description of this species will be given in my revision of the American Palaemonidae in the Reports of the Allan Hancock Expeditions (Holthuis, in press).

The cotypes of *Palaemon latirostris* De Haan, present in the collection of the Rijksmuseum van Natuurlijke Historie at Leiden, show no differences with the specimens of *Leander tenuicornis,* so that the species must be considered identical, as is already pointed out by De Man (1881). The specimens from Curaçao, preserved in the collection of the Leiden Museum have already been mentioned by Rathbun (1919), the specimens in the same collection from Japan, Waigeo and some from the Sargassum Sea were reported upon by De Man (1881), that from Noordwachter Island in the collection of the Amsterdam Museum by De Man (1888) and finally those from Curaçao, also in the Amsterdam Museum, by Schmitt (1924). The specimen with the label "Amsterdam" probably does not originate from that locality, though it might be introduced by ships.

According to a note accompanying the specimen from Muara Antjol near Batavia, the species is named there by the natives "udang ronggeng", which means "dancing girl prawn".

A specimen from Station 64 of the Snellius Expedition bears a Bopyrid parasite under the abdomen.

Distribution: The species is a common inhabitant of the floating Sargassum weed on high sea, but it also occurs in shallow water near the shore between seaweeds. It is circumtropic and occurs

in the indo-westpacific region from the Red Sea and Réunion to Japan, New Guinea, Australia and New Zealand; in the Atlantic it is known from New Foundland Banks and Bermuda to S. Brazil and the Falkland Islands, from the Sargassum Sea, and the Eastern Atlantic from the Mediterranean to south of the Azores.

Leander urocaridella nom. nov.

Urocaridella gracilis Borradaile, 1915, Ann. Mag. nat. Hist., ser. 8 vol. 15, p. 210.
Urocaridella gracilis Borradaile, 1917a, Trans. Linn. Soc. Lond. Zool., ser. 2 vol. 17, p. 352, pl. 53 fig. 2.
Urocaridella gracilis Kemp, 1922, Rec. Indian Mus., vol. 24, p. 122.

Siboga Expedition

Station 7, near reef of Badjulmati, E. Java, 7° 55'.5 S, 114° 26' E; dredge and shore exploration; depth 15 m and more; bottom coral and stones; March 11, 1899. — 1 specimen 31 mm.
Station 47, Bay of Bima; trawl, dredge and shore exploration; depth up to 55 m; bottom mud with patches of fine coral sand; April 8-12, 1899. — 1 specimen 19 mm.
Station 71, Makassar; dredge, townet and shore exploration; depth up to 32 m; bottom mud, sand with mud and coral; May 10 till June 7, 1899. — 1 ovigerous female 33 mm.

Museum Leiden

Java Sea. — 1 specimen 25 mm.

Description: The rostrum is very long and slender, it is about twice as long as the carapace and is strongly curved upwards, it reaches far beyond the scaphocerite. The upper margin of the rostrum bears 8 teeth; the first tooth is placed over the posterior margin of the orbit, the second is situated close near the first, the distance between the third and the second tooth is much larger than that between the first and the second, the third tooth is very small and placed over the anterior part of the basal segment of the antennular peduncle. The fourth and fifth teeth are somewhat larger than the third and are placed close together, near the third tooth; distally of the fifth tooth the upper margin of the rostrum is entire for a long distance; close to the apex three teeth are present, which are placed close together and diminish in size gradually. On the middle of the median dorsal line of the carapace a strong tooth is present; like the first two teeth of the rostrum, this tooth has the tip curved anteriorly, the lower margin of the tip of each of these strong teeth is finely serrate, resembling in this respect the Pontoniid prawn *Periclimenes psamathe* De Man. The lower margin of the rostrum is provided with nine to eleven teeth, the proximals of which are placed close together, the distals are separated by larger intervals. Like in the previous species a row of hairs is present in the lower part of each of the lateral surfaces of the rostrum some distance above the bases of the ventral teeth; these hairs are directed ventrally and cover the lower teeth of the rostrum. The antennal spine of the carapace is strong and placed below the lower orbital angle, which is produced forwards as a large rounded lobe. The branchiostegal spine is about as strong as the antennal and is placed some distance behind the anterior margin of the carapace, but reaches with its tip slightly beyond that margin.

The abdomen is smooth. The pleurae of the first four segments are broadly rounded, that of the fifth is narrower and ends in a small, but distinct, sharp point. The fifth abdominal segment is slightly more than half as long as the sixth.

The telson is about as long as the sixth abdominal segment. The anterior pair of dorsal spines of the telson is situated in the middle of the telson, the other pair is placed about halfway between the

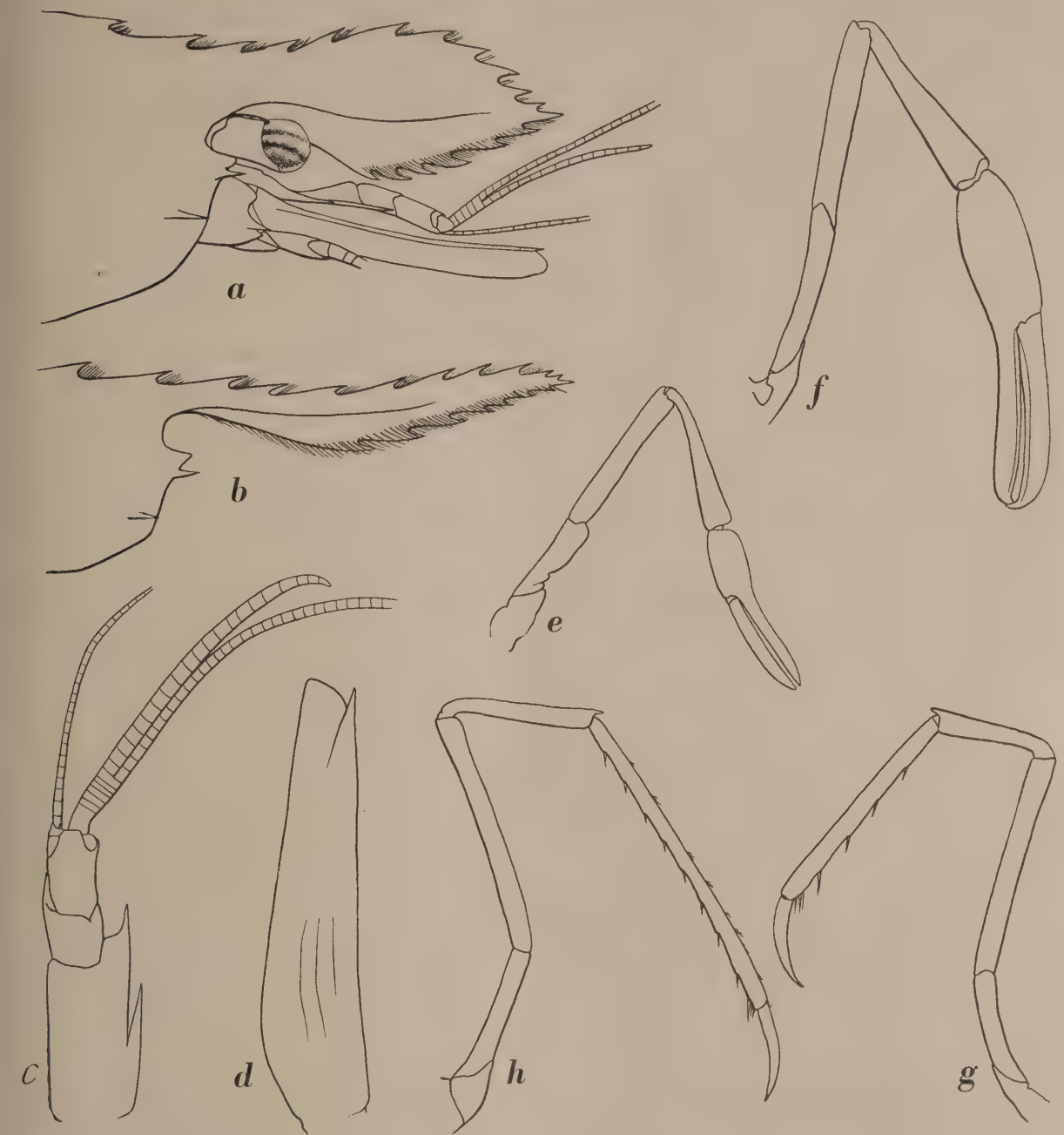

Fig. 2. *Leander tenuicornis* (Say). a, rostrum of a female; b, rostrum of a male; c, antennula; d, scaphocerite; e, first pereiopod; f, second pereiopod; g, third pereiopod; h, fifth pereiopod. a, b, × 8.5; c-h, × 12.

anterior pair and the posterior margin of the telson. The posterior margin ends in a distinct point, which is flanked at each side by two spines and a strong feathered seta. This feathered seta is so strong, that one might call it a setose spine.

The eyes are elongate and reach about ¾ of the length of the basal segment of the antennular peduncle. The eyestalk is much longer, but distinctly narrower than the cornea.

The first segment of the antennular peduncle is broad and reaches somewhat beyond the middle of the scaphocerite. The stylocerite is well developed and ends in a sharp point, it fails to reach the middle of the basal segment. The anterolateral spine of this basal segment is distinct, but does not reach the middle of the second segment of the peduncle; the anterior margin of the basal segment is convex and fails to reach the end of the anterolateral spine. The second segment is distinctly shorter and slightly broader than the third. Together the second and third segments measure ¾ of the length of the first segment. The two rami of the upper flagellum are fused for about five segments, the free portion of the shorter ramus consists of about 9 segments, it is somewhat more than twice as long as the fused part.

The scaphocerite is well developed. The outer margin is almost straight and ends in a strong final tooth, which fails to reach the end of the lamella. The inner anterior angle of the lamella is almost rectangular. The last segment of the antennal peduncle fails to reach the middle of the scaphocerite.

The oral parts do not differ essentially from those of the previous species. The third maxillipede reaches about to the end of the basal segment of the antennular peduncle. The last segment is somewhat shorter than the penultimate, while the antepenultimate segment is about twice as long as the ultimate. The exopod is well developed. The base of the third maxillipede bears a rather large arthrobranch and a smaller pleurobranch, which is partly concealed by the arthrobranch.

The first pereiopod reaches almost the end of the scaphocerite. The fingers are long and slender, they are somewhat longer than the palm. The carpus is about as long as the palm and narrows posteriorly. The merus is as long as the palm and the carpus together. The ischium is half as long as the merus and is somewhat broadened. The second pereiopods are equal in shape, they reach with the entire chela beyond the scaphocerite. The fingers are very slender, they measure almost 1.5 times the length of the palm, they bear no teeth. The carpus is much shorter than the palm and the merus is about twice as long as the carpus. The ischium is more than half as long as the merus. None of the segments bears any spine. The last three pereiopods are of equal shape, all three reach beyond the scaphocerite. The dactylus is very slender and simple. The propodus of the third leg is thrice, those of the fourth and fifth legs are about four times as long as the dactylus. The posterior margin of the propodus bears some scattered spinules, the ultimate of which is by far the strongest. The carpus is about half as long as the propodus and the ischium is about as long as the carpus.

The first pleopod of the male has the endopod provided with an appendix interna. The other pleopods are normal in shape.

The uropods are quite typical.

Figures of this species are given by Borradaile (1917a).

Borradaile (1915, 1917a) described the present species under the name *Urocaridella gracilis*, making it the type of a new genus of Pontoniinae. In reality, however, the species belongs to the Palaemoninae as is shown by the presence of a pleurobranch at the base of the third maxillipede. The species shows all characters of the genus *Leander*, so that it has to be incorporated in that genus. The name of the species therefore should have to become *Leander gracilis* (Borradaile, 1915), this name, however, is preoccupied by *Leander gracilis* Smith (1871). A new name thus is needed for the

present form, for which I propose *Leander urocaridella* nom. nov. Borradaile indicates the branchiostegal spine under the name hepatic spine; comparison with the branchiostegal spine of *Leander tenuicornis* shows that the spine of *L. urocaridella* indeed is the branchiostegal too.

Distribution: This litoral form has been reported in literature from: the Suvadiva, Kolumadulu and Haddumati Atolls in the Maldive Archipelago (Borradaile, 1915, 1917a), off Chilka Lake, Orissa Coast (Kemp, 1922), Port Blair, Andaman Islands (Kemp, 1922), Mergui Archipelago: 12° 40′ N, 98° 26′.5 E and 11° 17′.3 N, 98° 29′.6 E (Kemp, 1922).

Leander kempi nov. spec. (fig. 3)

Siboga Expedition

Station 121, Menado anchorage; shore exploration; depth 55 m; July 14-16, 1899. — 2 specimens (one of which an ovigerous female) 31 and 48 mm.

Snellius Expedition

Beo, Talaud Islands; June 14-21, 1930. — 1 ovigerous female 37 mm.

Description: The rostrum (figs. 3a, b) is rather high, straight, and slightly directed upwards, it reaches a little beyond the end of the scaphocerite. The upper margin of the rostrum bears 12 to 14 teeth, which are regularly divided over the entire length of the margin. The two posterior teeth are placed behind the posterior orbital margin, the first is distinctly more remote from the second than the third is. The two anterior teeth are smaller than the rest and are placed rather close near the apex. Between these teeth a single row of hairs is present. The lower margin of the rostrum bears 5 to 7 teeth, which are placed on the anterior $^2/_3$ of the margin; anteriorly the teeth become smaller. A row of long setae is present on each side of the rostrum slightly above the bases of the ventral teeth; these setae are directed downwards and entirely cover the ventral teeth. The carapace is smooth, though short and rather stiff hairs often are scattered over its surface. The antennal spine is placed some distance below the rounded lower orbital margin; the branchiostegal spine is somewhat stronger than the antennal, it is distinctly remote from the anterior margin of the carapace, the tip of this spine just reaches or fails to reach the anterior margin. The branchiostegal groove is absent.

The abdomen is smooth, similar hairs as on the carapace are present here, they even are more numerous especially on the posterior segments. The pleurae of the first three segments are broadly rounded. Those of the fourth and fifth segment are narrower, they do not end in an apical tooth. The sixth segment is rather short and high, it is less than 1.5 times as long as the fifth.

The telson is elongate, it is much shorter than the uropods. The anterior of the two dorsal pairs of spines is placed immediately behind the middle of the telson, the posterior pair is situated about midway between the anterior pair and the posterior margin of the telson. This posterior margin ends in a sharp point, which is flanked at each side by the usual two spines; the inner spines are very long and slender with curved tips. Two strong feathered setae are present between the inner spines. The dorsal surface of the telson is densely pubescent.

The eyes are well developed, they are not as elongate as in *L. urocaridella*. The cornea is broader and shorter than the stalk. The black pigment is not divided regularly over the cornea, but

shows two concentric bands in which the pigment is much less distinct than in the rest of the cornea. A distinct ocellus is present.

The basal segment of the antennular peduncle is broad. The stylocerite is short, rather slender

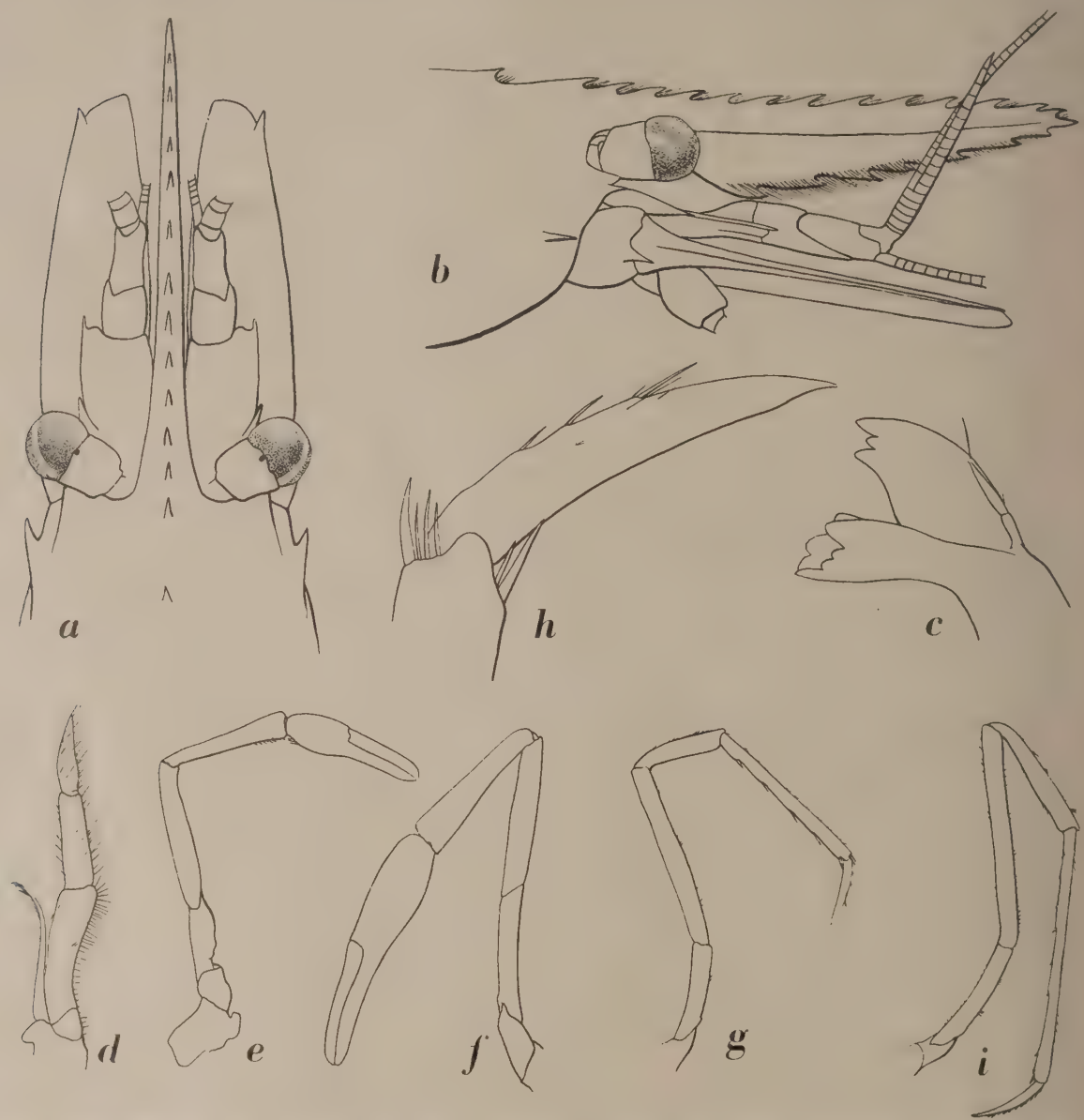

Fig. 3. *Leander kempi* nov. spec. a, anterior part of body in dorsal view; b, anterior part of body in lateral view; c, mandible; d, third maxillipede; e, first pereiopod; f, second pereiopod; g, third pereiopod; h, dactylus of third pereiopod; i, fifth pereiopod. a, b, d-g, i, × 10; c, × 33; h, × 50.

and sharp, it fails to reach the middle of the basal segment. The outer margin of the basal segment is about straight and ends in a distinct tooth which reaches about to the middle of the second segment of the peduncle and overreaches the convex anterior margin of the basal segment. The second segment is slightly shorter than the third, together they are about as long as the first segment. The upper antennular flagellum has the two rami fused for about seven joints, the free part of the shorter ramus

consists of 12 to 15 joints and is slightly more than twice as long as the fused portion.

The scaphocerite just fails to reach the end of the rostrum, it reaches with about 1/3 of its length beyond the antennular peduncle. The outer margin is straight and ends in a strong final tooth, which is distinctly overreached by the lamella. The scaphocerite is slightly more than thrice as long as broad, its greatest breadth lies close near the base; the anterolateral angle of the lamella is rather acute. The antennal peduncle almost reaches 1/3 of the length of the scaphocerite.

The oral parts (figs. 3c, d) are quite typical. The third maxillipede reaches slightly beyond the end of the antennal peduncle. The penultimate segment is distinctly longer than the ultimate. The antepenultimate segment is almost 1.5 times as long as the penultimate. The exopod reaches beyond the antepenultimate segment.

The first pereiopod (fig. 3e) reaches slightly beyond the end of the antennular peduncle, but largely fails to reach the end of the scaphocerite. The fingers measure 4/3 of the length of the palm and are unarmed. The palm is somewhat swollen. The carpus is about as long as or slightly shorter than the chela, and broadens anteriorly. The merus is somewhat longer than the carpus. The ischium is about half as long as the merus. The second pereiopod (fig. 3f) is stronger than the first, it reaches with half the length of the fingers beyond the scaphocerite. The fingers are about as long as the palm, they are slender and bear no teeth. The palm is swollen. The carpus measures about 3/5 of the length of the entire chela, it is broadest distally and narrows proximally. The merus and ischium are subequal in length, they are each about as long as the carpus, the merus being generally slightly longer than both carpus and ischium. The last three pereiopods are slender. The third (fig. 3g) reaches about to the end of the antennular peduncle. The simple dactylus (fig. 3h) bears some hairs on the anterior margin. The propodus is about 2.5 times as long as the dactylus and has the posterior margin provided with some five spinules. The carpus is half as long as the propodus; the merus is slightly longer than the propodus, while the ischium is somewhat more than half as long as the merus. The fifth pereiopod (fig. 3i) is much more slender than the third, it reaches somewhat beyond the tip of the scaphocerite. The dactylus strongly resembles that of the third leg. The propodus is thrice as long as the dactylus and like in the third leg bears scattered spinules along its posterior margin. The carpus is half as long as the propodus. The merus is distinctly shorter than the propodus, while the ischium is somewhat more than half as long as the merus. The fourth pereiopod is intermediate in shape between the third and the fifth. All joints of these pereiopods bear many short setae. In the young specimen of the Siboga Expedition the legs are generally somewhat shorter.

The pleopods of my female specimens are normal in shape. Among the material at hand no males are present.

The uropods are elongate and much longer than the telson (the final spines excluded). The endopod is slightly shorter than the exopod. The shape of the uropods is quite typical.

The present species is closely related to *Leander tenuicornis*, but differs from that species in the following features:

1. The pubescence of the body of *L. kempi*, especially of the abdomen, is not observed in *L. tenuicornis*.

2. The basal segment of the antennular peduncle in *L. tenuicornis* has the stylocerite much longer, reaching beyond the middle of the segment and the anterior margin of that segment is not so strongly convex as in *L. kempi*.

3. The fingers of the second pereiopod of *L. kempi* are as long as the palm, in *L. tenuicornis* they generally are longer. Furthermore the second pereiopods in *L. kempi* do not reach as far forwards as they do in *L. tenuicornis*.

4. The fourth and fifth abdominal segments in *L. kempi* have their tips rounded, while they end in a distinct tooth in *L. tenuicornis*.

The second and fourth points are the most important in my opinion.

Leandrites nov. gen.

Definition: The body is slender, compressed. The rostrum is compressed, well developed and provided with teeth on the upper and lower margins. The upper margin bears a single row of setae, which is placed between the teeth, while a row of setae is placed in the lower portion of each of the lateral surfaces, somewhat above the bases of the ventral teeth of the rostrum, these hairs are directed ventrally and cover the lower rostral teeth. The carapace is smooth, it is provided with well developed antennal and branchiostegal spines. The branchiostegal spine is distinctly remote from the anterior margin of the carapace. No branchiostegal groove is present. The anterolateral angle of the carapace is rounded.

The abdomen is smooth. The pleurae of the first three segments are broadly rounded, that of the fourth and fifth segments are narrower. The pleura of the sixth segment is very short and ends just like the posterolateral angle in a sharp tooth. The sixth segment is about 1.5 times as long as the fifth.

The telson is elongate and slender, its dorsal surface is provided with two pairs of spines, the posterior margin too bears two pairs of spines, between which two very heavy, feathered setae are present. Of the two pairs of spines the outer is very short, the inner long and slender. The setae often are so heavy that they perhaps better can be described as setose spines.

The eyes are well developed, the cornea is hemisphaerical.

The basal segment of the antennular peduncle is very broad, it bears a slender stylocerite and has the anterolateral angle ending in a spine. The second and third segments are shorter and narrower. The upper flagellum consists of two rami, which are fused for a short distance.

The scaphocerite is well developed and ends in a distinct final tooth. A distinct exterior tooth is present at the basal part of the antennal peduncle. The end of the antennal peduncle fails to reach to the middle of the scaphocerite.

The mandible (fig. 4a) bears no palp, the molar and incisor processes are well developed. The maxillula (fig. 4b) has the inner lacinia slender, the upper lacinia bears strong distal spines, the palp is well developed and is distinctly cleft. The maxiila (fig. 4c) has the endite deeply cleft, the palp is distinct, the scaphognathite is large but not very broad. All maxillipedes are provided with well developed exopods. The first maxillipede (fig. 4d) has the basis and coxa separated by a distinct notch, the palp and the caridean lobe of the exopod are well developed, the epipod is bilobed. The second maxillipede (fig. 4c) shows the same shape as that of *Leander,* here too the last and the penultimate segments are fused over their entire length and a podobranch is present. The third maxillipede (fig. 4f) is slender, it is provided with an arthrobranch as well as with a pleurobranch.

The first pereiopods are slender and equal in shape. The second legs too are slender and equal, the fingers are very long and slender; none of the joints of the second leg bears spines or teeth.

The last three pereiopods are of equal shape and are very slender. The dactylus is simple, the propodus of the third leg only bears some posterior spinules, in both other legs it is entirely smooth, bearing only some scattered hairs on the posterior margin.

The endopod of the first pleopod of the male is provided with an appendix interna. The other pleopods are like in *Leander*. The uropods are elongate, longer than the telson. The outer margin of the exopod is straight and ends in a distinct tooth, which at its inner side bears a small movable spine.

Fig. 4. *Leandrites celebensis* (De Man). a, mandible; b, maxillula; c, maxilla; d, first maxillipede; e, second maxillipede; f, third maxillipede. a-c, × 33; d, e, × 27; f, × 14.

Type species: *Leander celebensis* De Man, 1881.

The present genus very closely resembles the genus *Leander*; in fact the only important difference between these two genera is the absence of a mandibular palp in *Leandrites*, while such a palp is present in *Leander*. The relation between *Leander* and *Leandrites* therefore is the same as that between *Palaemon* and *Palaemonetes*.

At present three species of the genus *Leandrites* are known. These species may be separated as follows:

1. Second legs reaching with part of the carpus beyond the scaphocerite. Lower margin

of the rostrum with 3-9 teeth, which are divided regularly over the distal half of the rostrum 2

— Second legs reaching with almost entire merus beyond the scaphocerite. Lower margin of the rostrum entire for the larger part, only about 3 inconspicuous teeth are placed close near the apex. . . . . *stenopus*

2. Rostrum very slender, curved slightly upwards at the tip, reaching much beyond the end of the scaphocerite. Lower margin of rostrum provided with 8 or 9 teeth . . *indicus*

— Rostrum rather high, directed forwards, reaching to or slightly beyond the scaphocerite. Lower margin of rostrum provided with 3 to 5 (seldom 7) teeth . . . . *celebensis*

Leandrites celebensis (De Man) (fig 4)

Leander celebensis De Man, 1881, Notes Leyden Mus., vol. 3, p. 141.
Palaemonetes hornelli Kemp, 1925, Rec. Indian Mus., vol. 27, p. 318, figs. 14, 15.
Palaemonetes hornelli Nataraj, 1942, Current Sci., vol. 11, p. 468.
Leander wieneckii De Man MSS. in Museum Leiden.

Museum Leiden

Makassar, S. W. Celebes; January, 1880; leg. J. Semmelink (cotypes). — 20 specimens (included ovigerous females) 19-26 mm.

Antjol near Batavia; mangrove swamp; July 15, 1938; leg. F. P. Koumans. — 6 specimens (two of which are ovigerous females) 15-25 mm.

Pond near the Laboratorium voor Onderzoek der Zee (Laboratory for Marine Investigations), Batavia; July 18, 1938; leg. F. P. Koumans. — 1 specimen 22 mm.

Locality unknown. — 1 specimen 27 mm.

The specimens studied agree good with Kemp's (1925) excellent description and figures of *Palaemonetes hornelli*; the limbs of the second pereiopods of the females, however, generally are broader in my material, the relations between the lengths of the various parts of the limbs agree perfectly with those reported by Kemp. The oral parts of the present species are figured here, they show a large resemblance to those of *Leander*, only the mandibular palp is absent. The epipod of the first maxillipede is large and indistinctly bilobed.

The specimens from Makassar are the types of *Leander celebensis* De Man; these specimens were inserted in the collection of the Rijksmuseum van Natuurlijke Historie at Leiden under the name: "*Leander wieneckii* De Man type"; *Leander wieneckii* has never been described by De Man and examination of the specimens showed that they are in reality the types of *Leander celebensis* De Man. In his description De Man did not mention the shape of the oral parts, therefore the fact that the mandibular palp is absent escaped his notice, and the species was wrongly placed by him in the genus *Leander*. Kemp (1925) redescribed the species as *Palaemonetes hornelli*, overlooking De Man's description of *Leander celebensis*, which also is not inserted in Kemp's list of species of the genus *Leander*. The characters shown by the present species and the two following make it necessary in my opinion to place them in a separate genus, for which I indicate *Leandrites celebensis* as the type, being the best known of the three species.

Vertical distribution: The species is found in rather shallow, often brackish water near the shore.

Horizontal distribution: The species is recorded in literature from Travancore, S. India (Nataraj, 1942), Silavathurai Lagoon, Tuticorin and from Cochin backwater near Ernakulam, both localities in S. India (Kemp, 1925) and from off Makassar, S.W. Celebes (De Man, 1881).

Leandrites indicus nov. spec. (fig. 5)

Leander indicus? De Man, 1881, Notes Leyden Mus., vol. 3, p. 139.(non *L. indicus* Heller, 1865).

Museum Leiden

Off Makassar; January, 1880; leg. J. Semmelink. — 2 specimens 24 and 25 mm.

Description: The rostrum (figs. 5a-c) is long and slender, it reaches with 1/3 to 1/4 of its length beyond the scaphocerite, the tip is somewhat curved upwards. The dorsal margin bears 11-14 teeth; the first tooth is distinctly more remote from the second tooth than the second is from the third. The first and second teeth are placed on the carapace behind the orbital margin, the other teeth are regularly divided over the rest of the length of the rostrum, only the two or three distal teeth are placed close together near the apex of the rostrum; in one of the specimens the upper margin is entire for a short distance behind the penultimate tooth; before each tooth a short single row of setae is present. The lower border bears eight or nine teeth, which are regularly divided over the distal 2/3 of that margin. A double fringe of ventrally directed setae is present near the lower margin of the rostrum slightly above the bases of the ventral teeth, which are thereby entirely covered by these hairs. The carapace is smooth. The antennal spine is strong and is placed some distance below the rounded lower orbital angle. The branchiostegal spine is almost as strong as the antennal spine and is placed some distance behind the anterior margin of the carapace.

The abdomen is smooth. The pleurae of the first three segments are broadly rounded, those of the fourth and fifth are narrower, but have the tips rounded too. The sixth abdominal segment is about 1.5 times as long as the fifth, and is somewhat shorter than the telson.

The telson is of the usual elongate shape. The dorsal surface bears two pairs of spinules, the first of which is situated in the middle of the telson, the second pair is placed midway between the anterior pair and the posterior margin of the telson. The posterior margin ends in a sharp median point and bears three pairs of spinules: the outer pair is very short, the intermediate pair very long, reaching with much more than half its length beyond the tip of the telson, the inner pair is setose and perhaps also might be regarded as being very strong feathered setae.

The eyes reach almost the end of the basal segment of the antennular peduncle. A distinct ocellus is visible. The cornea is broader and slightly shorter than the stalk.

The stylocerite of the basal segment of the antennular peduncle ends in an acute point, it just fails to reach the middle of the basal segment. The outer margin of the segment is about straight and ends in a strong, slightly outwards directed anterolateral spine, which is overreached by the strongly convex anterior margin of the segment. The second segment of the antennular peduncle, when measured in dorsal line, is distinctly shorter than the third; together these two segments measure about 3/4 of the length of the basal segment. The upper antennular flagellum has the two rami fused for 6 or 7 joints, the free part of the shorter ramus is considerably longer than the fused part (in

both specimens at my disposal the shorter rami are broken, but in one 15 joints are still visible, this remaining free part of the shorter ramus being about thrice as long as the fused part).

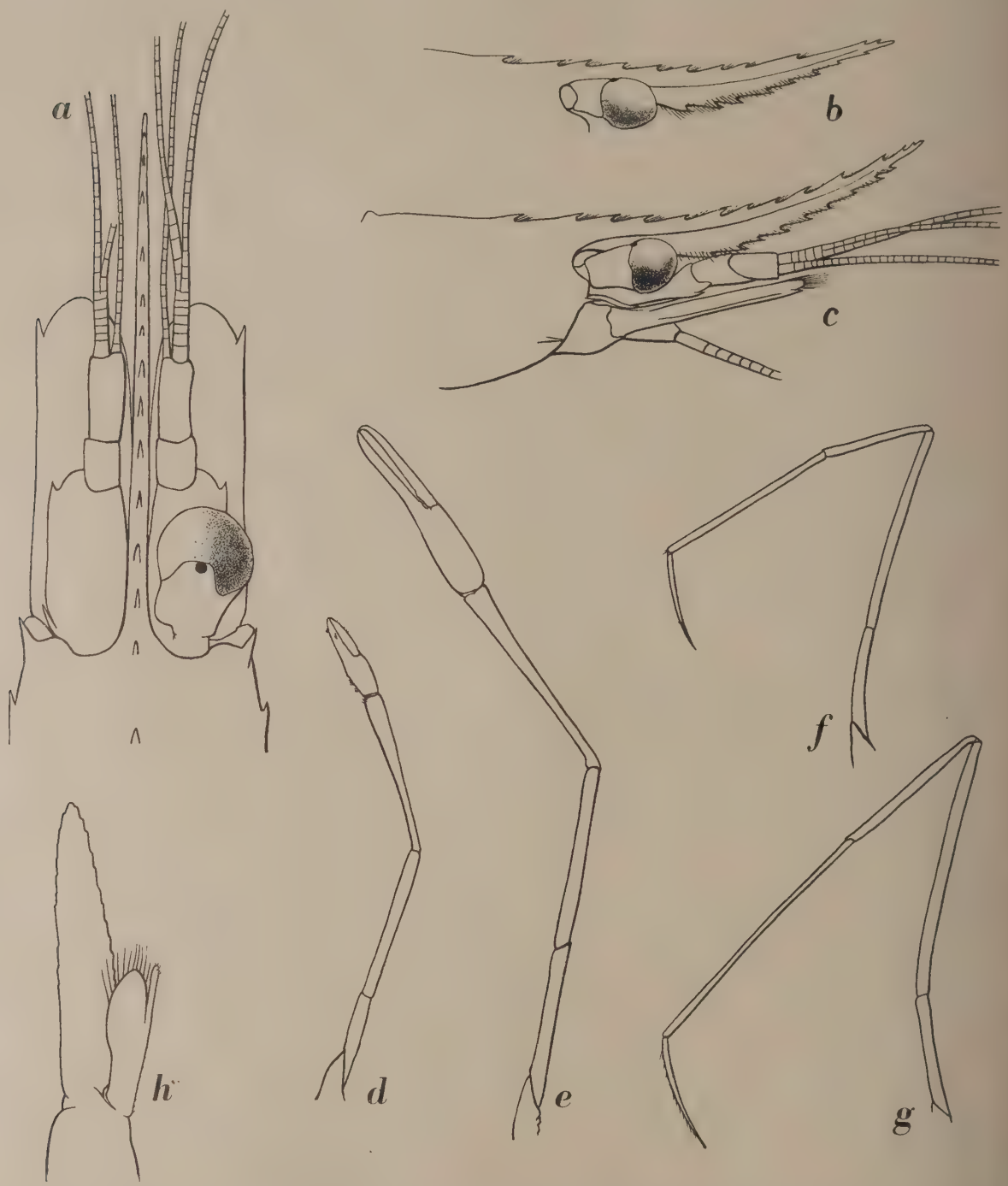

Fig. 5. *Leandrites indicus* nov. spec. a, anterior part of body in dorsal view; b, rostrum in lateral view; c, anterior part of body in lateral view; d, first pereiopod; e, second pereiopod; f, third pereiopod; g, fifth pereiopod; h, first pleopod of male. a-g, × 14; h, × 33

The scaphocerite reaches with about 1/5 of its length beyond the antennular peduncle, it is

about thrice as long as wide. The outer margin of the scaphocerite is almost straight and ends in a strong final tooth, which is outreached by the lamella.

The oral parts are quite typical, they do not differ essentially from those of the preceding species. The third maxillipede is slender, it reaches almost to the end of the basal segment of the antennular peduncle. The last segment of the maxillipede measures about $^2/_3$ of the length of the penultimate, while the antepenultimate segment is about twice as long as the ultimate; this antepenultimate segment is curved and is about four times as lang as broad.

The first pereiopods (fig. 5d) are slender and reach to or slightly beyond the scaphocerite. The fingers are slender and a trifle longer than the palm. The carpus is almost twice as long as the chela, it is broadened distally. The merus is distinctly shorter than the carpus, and the ischium is somewhat more than half as long as the merus. The second legs (fig. 5e) are long, they reach with part of the carpus beyond the scaphocerite, they are slender, but distinctly stouter than the first legs. The fingers are elongate, they are somewhat longer than the palm and have the tips curved inwards; in the proximal part of the cutting edge both fingers are provided with a minute tooth. The palm is a little swollen. The carpus is somewhat longer than the chela, it widens distally. The merus is subequal in length to the chela. The ischium is slightly shorter than the merus. The last three legs are very slender, the third (fig. 5f) reaches with the dactylus, the fifth even with part of the propodus beyond the scaphocerite. The third pereiopod has the dactylus very slender, it is a little longer than half the length of the propodus. The posterior margin of the propodus is naked. The carpus is about as long as the dactylus. The merus is a little longer and broader than the propodus. The ischium is of about the same length as the carpus. The fifth pereiopod (fig. 5g) has the dactylus very slender, it is half as long as the propodus. The carpus is distinctly longer than the dactylus. The merus is broader than, but of the same length as the propodus. The ischium is shorter than the carpus. The posterior margin of the propodus bears no spinules or transverse rows of setae. The fourth pereiopod is about intermediate in shape between the third and the fifth.

The endopod of the first pleopod of the male (fig. 5h) is provided with an appendix interna, which is well developed and reaches beyond the tip of the endopod. The appendix masculina of the second pleopod of the male is broad and reaches almost to the end of the appendix interna. The other pleopods are of the usual shape.

The uropods are elongate in shape. The endopod reaches beyond the telson, but fails to reach the end of the posterior spines of the telson. The shape of the uropods does not differ from that of the previous species.

Both specimens examined are males.

The present specimens were brought by De Man (1881) with some doubt to *Leander indicus* Heller. In my opinion, however, the differences between De Man's specimens and Heller's (1865) description, which for the larger part are also enumerated by De Man, are of specific importance. These differences are:

1. Heller's specimen is much larger (45 mm). De Man thought the present specimens to be juvenile, but this is contradicted, I think, by the well developed state of the appendix masculina of the second pleopods and of the appendix interna of the first pleopod.

2. The rostrum in Heller's specimen has the distal part of the upper margin entire for a long distance, in one of the present specimens no such entire portion may be observed, while in the other it is extremely short.

3. The relation between the lengths of the various joints of the second leg is entirely different in the two forms. In Heller's specimen the palm is longer than the fingers and the carpus is twice as long as the chela, in my specimens the fingers are longer than the palm and the carpus is scarcely longer than the chela.

4. In Heller's figure the dactylus of the third leg is much shorter than it is in my specimens.

Examination of Heller's specimen is badly needed, as his description and figure give too few data about his material, so for instance nothing is known about the oral parts, so that the generic position of the species even is not certain.

The present species shows close affinity to *Leandrites celebensis*, from which species it at once may be distinguished by the shape of the rostrum.

Leandrites stenopus nov. spec. (fig. 6)

Siboga Expedition

Station 2, Madoera Strait, 7° 25′ S, 113° 16′ E; trawl; depth 56 m; bottom grey mud with some radiolariae; March 8, 1899. — 1 specimen 22 mm.

Description: The rostrum (fig. 6a) is slender, it reaches beyond the end of the antennular peduncle and almost reaches the end of the scaphocerite; it is about straight. The upper margin is provided with 11 teeth, the first tooth is somewhat smaller than the second and is placed a larger distance from the second than the third is. The second tooth is placed closely behind the posterior limit of the orbit, the other teeth are regularly divided over the upper margin of the rostrum; in the distal part of that margin the teeth become gradually smaller. A single row of hairs is placed on the upper margin of the rostrum between the teeth. The lower margin is almost straight, it is entire for the larger part of its length, only three small teeth are present in the extreme distal part of the margin, the first of these teeth is placed on a level between the seventh and eighth dorsal tooth, the second ventral tooth is placed below the ninth dorsal and the third ventral below the tenth dorsal tooth. The lower part of the rostrum bears at each side a longitudinal row of ventrally directed setae, which cover the lower rostral margin. The carapace has the antennal spine strong and placed below the lower orbital angle, which is produced forwards to a broadly rounded lobe. The branchiostegal spine is about as strong as the antennal and is placed some distance behind the anterior margin of the carapace, reaching slightly beyond this margin with its tip. No branchiostegal groove is present.

The abdomen is smooth. The pleurae of the first five abdominal segments are rounded, those of the first four segments are broader than that of the fifth. The sixth segment is about 1.5 times as long as the fifth.

The telson is elongate, but falls short of the tip of the uropods. The dorsal spines are small, the anterior pair is situated about in the middle of the telson, while the posterior pair is placed closer to the posterior margin of the telson than to the anterior pair. The posterior margin ends in a sharp median point, at each side of which two spines and one seta are present: the outer spine is very short, the inner spine is long with the tip curved slightly inwards, the seta is situated closest near the median point of the posterior margin of the telson, it is very strong and resembles a spine, it bears fine hairs.

The eyes are rather large, the cornea is as long as and distinctly broader than the stalk.

The basal segment of the antennular peduncle has the stylocerite slender, pointed and very short, it distinctly fails to reach the middle of the basal segment. The anterolateral spine of the basal segment is distinct, but fails to reach the middle of the second segment of the peduncle; the anterior margin of the basal segment is strongly curved and produced forwards, reaching distinctly beyond the anterolateral spine. The second and third segments are much narrower than the basal segment, together they are shorter than the first segment. The third segment is distinctly longer than the second. The upper antennular flagellum has the two rami fused for about three joints; of both upper flagella

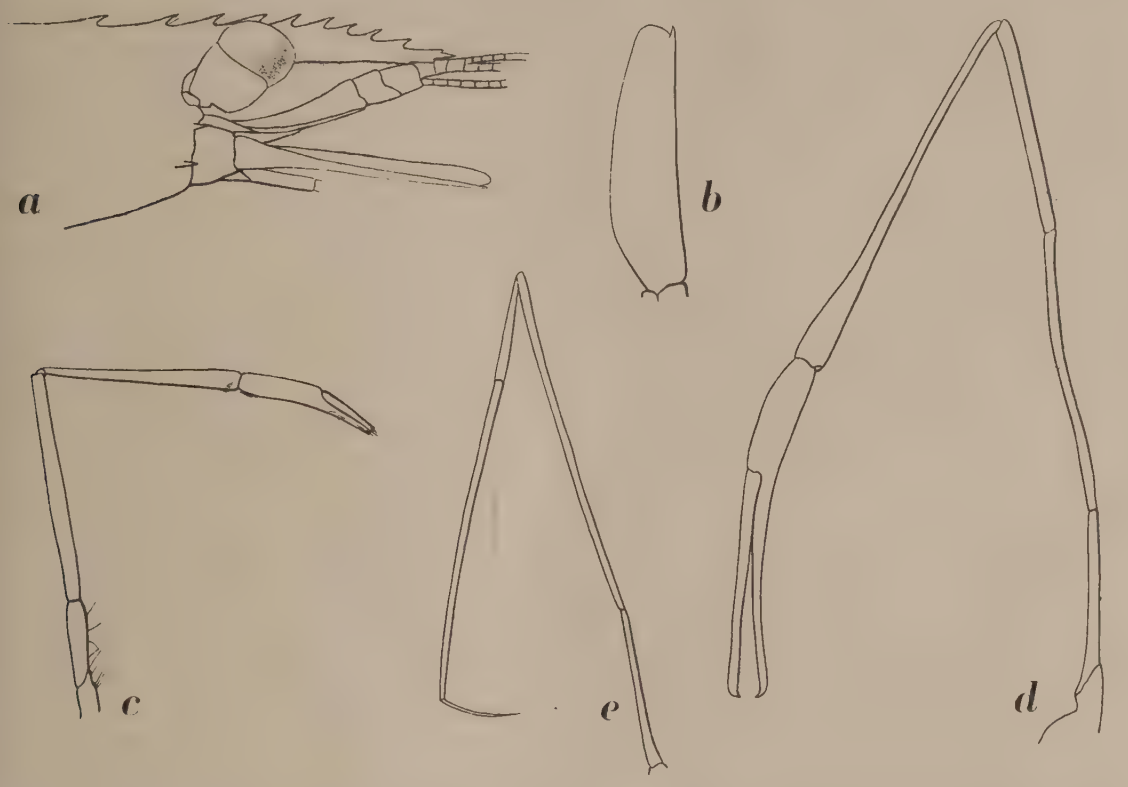

Fig. 6. *Leandrites stenopus* nov. spec. a, anterior part of body in lateral view; b, scaphocerite; c, first pereiopod; d, second pereiopod; e, third pereiopod. a-e, × 14.

in my specimen the shorter ramus is broken.

The scaphocerite (fig. 6b) reaches somewhat beyond the tip of the rostrum. The outer margin is slightly concave and ends in a final tooth, which reaches slightly beyond the lamella. The lamella is of about the same breadth over its entire length.

The oral parts closely resemble those of *L. celebensis*; the first maxillipede, however, has the epipod deeply bilobed. The third maxillipede is long and slender, it almost reaches the end of the scaphocerite. The last segment is about half as long as the preceding, the antepenultimate segment is longer than the penultimate, but shorter than the last two segments combined.

The first pereiopod (fig. 6c) is slender, it reaches with about half the carpus beyond the end of the scaphocerite. The fingers are elongate and provided with numerous setae, they are shorter

than the elongate palm. The carpus is slender, it is about 1.5 times as long as the chela, it is broadest distally and narrows proximally. The merus is distinctly longer than the carpus. The ischium is about half as long as the merus. The second pereiopod (fig. 6d) (in my specimen only the left pereiopod of the second pair is present) is extremely slender, it reaches with almost the entire merus beyond the scaphocerite. The fingers are very long and slender, they are about twice as long as the palm and of the same width throughout their length, the cutting edge is entire and the tips of the fingers are rather strongly curved inwards. The carpus is somewhat longer than the chela, it is unarmed, the distal portion is broadest, the chela gradually narrows proximally. The merus is about half as long as the carpus. The ischium is distinctly longer than the merus and the basis is somewhat shorter than the merus. The last three pereiopods are of about equal structure. The third (fig. 6e) reaches with half the carpus beyond the scaphocerite. The dactylus is simple, it is very long, slender and curved, it measures about $^1/_3$ of the length of the propodus. The propodus too is long and slender, it is about 2.5 times as long as the carpus. The merus is about as long as the propodus and the ischium is of about the same length as the carpus. All joints are filiform.

The shape of the first two pleopods of the male are unknown, the only specimen at my disposal being a female.

The uropods show no important differences from those of the two previous species.

The species may at once be recognized by the shape of the rostrum and the extremely long legs. The very long second pereiopods show a curious resemblance to those of the Pontoniid prawn *Periclimenes longipes* (Stimpson), but may at once be distinguished from that species by the long fingers of that leg.

Palaemon Fabricius, 1798

Description: Body slender or more robust, compressed. The rostrum is well developed, it is compressed and provided with teeth at both sides. The upper margin of the rostrum bears a single row of hairs, which is placed between the dorsal teeth. The lower margin is provided either with a single row like that of the dorsal margin or with a double row, in the latter case the hairs are placed so close near the lower margin that they do not entirely cover the ventral teeth of the rostrum. The carapace is smooth and provided with antennal and branchiostegal spines. The antennal spine generally is strong and situated on the anterior margin of the carapace some distance below the rounded lower orbital angle. The branchiostegal spine is placed either on the anterior margin of the carapace or slightly remote from it. A distinct sharp branchiostegal groove generally is present, it reaches the anterior margin of the carapace just above the branchiostegal spine; anteriorly the groove runs horizontally, in the posterior part it curves downwards. The anterolateral angle of the carapace is rounded.

The abdomen is smooth. The pleurae of the first three segments are broadly rounded, those of the fourth and fifth segments are narrower, the apex of the fifth segment sometimes ends in a minute sharp tooth. The sixth abdominal segment has the pleurae very short, they end in a posteriorly directed spine; the posterolateral angle of that segment too ends in a sharp point. The sixth segment is distinctly longer than the fifth.

The telson is elongate triangular and generally bears two pairs of spines on the dorsal surface, sometimes one or even both pairs are absent. The posterior margin of the telson ends in an acute point,

and generally bears 4 spines, the outer of which are very short, the inner pair is much longer. Between the two inner spines two long feathered setae are present. In some species there are only two posterior spines, in others both pairs are wanting.

The eyes are well developed. The cornea is hemisphaerical. An ocellus is present.

The basal segment of the antennular peduncle is very broad, it is provided with a distinct slender and sharp stylocerite. The anterolateral angle of that segment is produced to a sharp spine, the anterior margin of the segment is convex. The second and third segments of the antennular peduncle are much shorter and narrower than the basal segment. The antennula bears two flagella, the lower is simple, the upper consists of two rami, which have the basal joints fused.

The scaphocerite is large and reaches beyond the end of the antennular peduncle. The outer margin of it ends in a strong tooth, which is overreached by the broad lamella; the greatest breadth of the lamella lies slightly above the base of that scale, which narrows slightly towards the apex. A distinct exterior spine is present in the basal part of the antennal peduncle; this peduncle fails to reach the middle of the scaphocerite.

The mandible is provided with a two- or threejointed palp; the incisor process ends in three distinct teeth, the molar process bears in its distal part blunt knobs and ridges and sometimes is provided with a row of spinules. The maxillula has the inner lacinia rather slender, the upper lacinia is provided with a row of strong teeth at its distal margin, the palp is well developed and distinctly bilobed. The maxilla has the endite deeply cleft, the palp is well developed, the scaphognathite is large, but not very broad. All maxillipedes are provided with well developed exopods. The first maxillipede has the basis and coxa separated by a distinct notch, the palp is well developed, the exopod bears in the basal part a rather broad caridean lobe, and the epipod is large and distinctly bilobed. The second maxillipede is pediform, it has the last joint fused with the penultimate for its entire length. The exopod reaches distinctly beyond the endopod. A large epipod and a well developed podobranch are present at the base of the second maxillipede. The third maxillipede is slender, it is provided with an arthrobranch and a pleurobranch.

The first pereiopods are slender. The fingers are unarmed and provided with tufts of setae. The propodus bears in the proximal part of its lower margin some stiff posteriorly directed setae, which, together with some longer anteriorly directed setae of the anteroventral part of the carpus form an organ for cleaning purposes. The carpus is slender, it is longer than the chela. The second pereiopods are slender too, but they are more heavily built than the first pair. No teeth are present on the merus or carpus. The last three pairs of pereiopods are of similar construction mutually. The third pair is shortest, the fourth and fifth are longer and more slender. The dactylus is falcate and simple. The fifth pereiopod has the posterior margin provided in the distal part with some transverse rows of setae, while spinules generally are present on the posterior margin of the third, fourth and fifth pereiopods.

The pleopods are leaf-shaped. The endopod of the first pair is smaller than the exopod, in the male this endopod is ovate in shape and never bears a well developed appendix interna, in most species this appendix is entirely absent, only in *P. concinnus* a rudiment of it is visible. The second pleopods of the male are provided with an appendix interna as well as with an appendix masculina, all following pleopods only bear an appendix interna.

The uropods are elongate, they reach beyond the tip of the telson. The endopod is ovate in

shape. The exopod is broader, the outer margin of it is straight or slightly convex and ends in a distinct tooth, which at its inner side is provided with a slender movable spine. A row of setae is present along the lower side of the lateral margin of the exopod.

The genus *Palaemon* may be subdivided into four subgenera, which may be distinguished by the characters given in the key (p. 5).

Subgenus **Nematopalaemon** nov.

This new subgenus is very close to the subgenus *Exopalaemon* nov. It resembles that subgenus in the shape of the rostrum, which is very elongate and slender and bears an elevated basal crest of teeth on the upper margin. The differences between the two groups are very important and in my opinion justify their separation as distinct subgenera. In *Nematopalaemon* the branchiostegal groove is absent, the dactyli of the last three legs are unusually long and the stylocerite bears a dorsal tooth. In *Exopalaemon* the branchiostegal groove is present and visible as a distinct sharp line, the dactyli are normal in shape (only in *Palaemon* (*Exopalaemon*) *annandalei* the dactylus is almost as long as the propodus, but still is much shorter than in the species of *Nematopalaemon*), and the stylocerite has no dorsal tooth.

The name *Nematopalaemon* is given because of the threadlike last legs, which give the animals a superficial resemblance to the species of the genus *Nematocarcinus*.

Type of this subgenus is *Leander tenuipes* Henderson.

The subgenus consists of three species, one of which, *P. tenuipes*, occurs in the indo-west-pacific region, one, *P. hastatus*, is Westafrican and one, *P. schmitti*, is known from the northcoast of South America.

In the present collection only one species is represented:

Palaemon (*Nematopalaemon*) *tenuipes* (Henderson) (fig. 7)

Leander tenuipes Henderson, 1893, Trans. Linn. Soc. Lond. Zool., ser. 2 vol. 5, p. 440, pl. 40 figs. 14, 15.
Leander tenuipes Nobili, 1903, Boll. Mus. Zool. Anat. comp. Torino, vol. 18 n. 452, p. 7.
Leander tenuipes Kemp, 1917, Rec. Indian Mus., vol. 13, p. 206, pl. 8 fig. 1.
Leander tenuipes Kemp, 1917a, Rec. Indian Mus., vol. 13, p. 234, fig. a.
Leander tenuipes Kemp, 1925, Rec. Indian Mus., vol. 27, p. 289.
Palaemon luzonensis Blanco, 1939a, Philipp. Journ. Sci., vol. 67, p. 201, pl. 1.
Leander tenuipes Chopra, 1943, Indian Sci. Congr., vol. 30 pt. 2 sect. 6, p. 5.
? *Leander* aff. *tenuipes* Vatova, 1943, Thalassia, vol. 6 pt 2, p. 11, pl. 1 fig. 2.

Museum Amsterdam

Matlah River, Gangetic Delta; December, 1916; coll. J. G. de Man. — 3 specimens (2 of which ovigerous females) 64-68 mm.

The above specimens formed part of the material described by Kemp (1917) and were presented by the Indian Museum to the Dutch carcinologist Dr. J. G. de Man, after whose death the material was incorporated in the collection of the Zoological Museum at Amsterdam.

Kemp (1917) gives an excellent description and figures of the present form. The oral

parts of the species are figured here (fig. 7). In the specimens seen by me two pairs of spines are present on the dorsal surface of the telson and two pairs on the posterior margin. The anterior dorsal pair and the outer posterior pair, however, are extremely small, and therefore probably overlooked by Kemp, who only mentions one pair of dorsal and one of posterior spines.

The specimens described by Blanco (1939a) as a new species under the name *Palaemon luzonensis* undoubtedly belong to the present species, as is clearly shown by Blanco's description and good figures.

Vertical distribution: The species occurs in superficial coastal waters up to a depth of about 17 m; it lives in salt as well as in brackish waters. *Palaemon tenuipes* is of economic importance in the Gangetic delta (vid. Kemp, 1917, p. 203; Chopra, 1943, p. 5) as well as in Northern Luzon (vid.

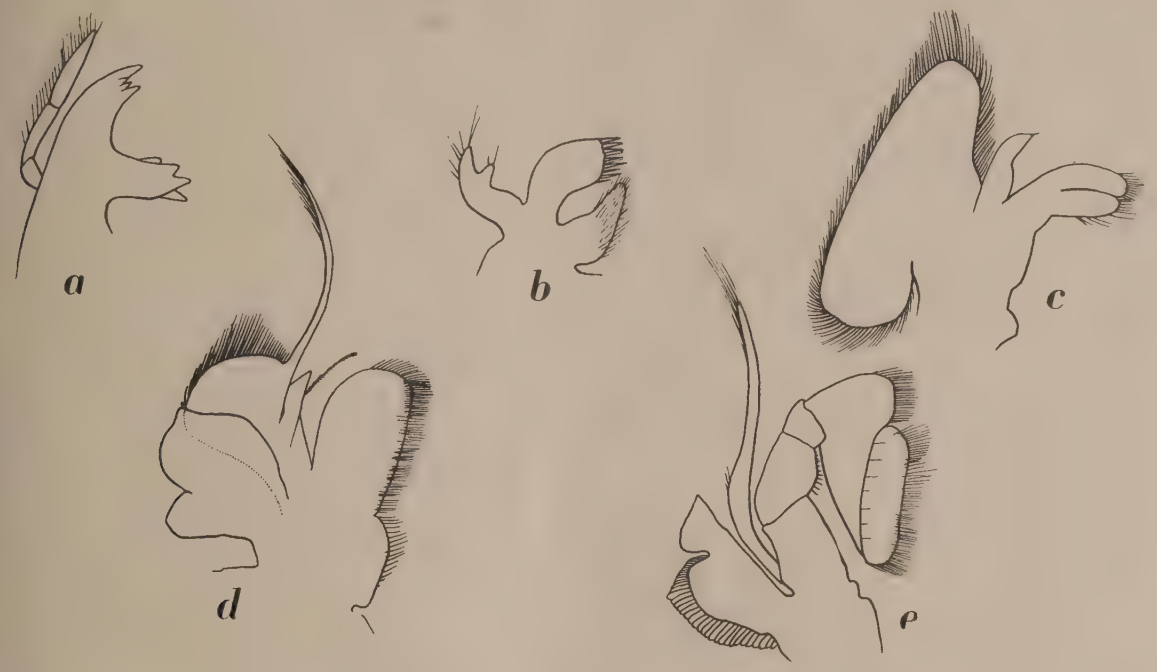

Fig. 7. *Palaemon* (*Nematopalaemon*) *tenuipes* (Henderson). a, mandible; b, maxillula; c, maxilla; d, first maxillipede; e, second maxillipede. a-e, × 14.

Blanco, 1939a, p. 201); vast numbers of specimens are caught and sold immediately or are dried and salted.

Horizontal distribution: The species is recorded in literature from: Juba, Italian Somaliland? (Vatova, 1943), Bombay (Henderson, 1893; Nobili, 1903), Madras (Henderson, 1893; Kemp, 1917), Tanda and near Vizagapatam, Madras Presidency (Kemp, 1917), Puri, Orissa Coast (Kemp, 1917), many localities in the Gangetic Delta (Kemp, 1917), Gulf of Martaban (Henderson, 1893), mouths of Rangoon River, Moulmein River and Bassein River, Burma (Kemp, 1917), Green Island, Tennasserim (Kemp, 1917), mouth of Cagayan River, Northern Luzon (Blanco, 1939a), ? Lyttelton Harbour, New Zealand (Kemp, 1917).

Subgenus **Exopalaemon** nov.

As already pointed out under *Nematopalaemon,* the present subgenus is very closely related to the latter. The differences between the two groups have already been given (pp. 5, 44). Kemp

(1917) united these two subgenera and the genus *Leptocarpus* as "*Leander styliferus* and related species". *Leptocarpus* is excluded from the genus *Palaemon* in the present paper, while also the two other groups differ so much, that in my opinion they are distinct subgenera. *Palaemon annandalei* is more or less intermediate between *Nematopalaemon* and *Exopalaemon,* but distinctly shows more affinity to the latter subgenus.

The type of the present subgenus is *Palaemon styliferus* H. Milne Edwards.

At present 7 species of *Exopalaemon* are known, all seven ocurring in the indo-westpacific region. A key to the species of *Exopalaemon, Nematopalaemon* and *Leptocarpus* is given by Kemp (1917). This key also is included in Kemp's (1925) key to the species of the genus "*Leander*".

Palaemon (*Exopalaemon*) *annandalei* (Kemp)

Leander annandalei Kemp, 1917, Rec. Indian Mus., vol. 13, p. 211, figs. 1-4.
Leander annandalei Kemp, 1918a, Mem. Asiat. Soc. Bengal, vol. 6, p. 268.
Palaemon (Leander) annandalei Gee, 1925, Lingnaam agric. Rev., vol. 3, p. 158.
Leander annandalei Kemp, 1925, Rec. Indian Mus., vol. 27, p. 289.
Leander annandalei stylirostris Yu, 1930, Bull. Soc. zool. France, vol. 55, p. 460, figs. C, P.
Leander annandalei Yu, 1930, Bull. Soc. zool. France, vol. 55, p. 460, figs. CC, PP.
Leander Annandalei Yu, 1930a, Bull. Soc. zool. France, vol. 55, p. 554.
Leander Annandalei stylirostris Yu, 1930a, Bull. Soc. zool. France, vol. 55, pp. 554, 557.
Leander stylirostris Kubo, 1942, Journ. Imp. Fish. Inst. Tokyo, vol. 35, p. 66, figs. 19H, S, 20H, 21H, 22H, 23N, S, 27K, 28J, 29I, 31.

This species of which no material is at my disposal, is extensively described and figured by Kemp (1917). Yu (1930) described a new variety of this species as *Leander annandalei* var. *stylirostris,* which differs from the main form by that the rostrum is longer, and that the carpus of the first pereiopod is longer in relation to the chela. These differences, however, in all probability are due only to age. Of the 5 specimens mentioned by Yu, in which the rostrum is entire, two are 63 mm in length, one is 62 mm, one 59 and one 48 mm. Kemp's specimen measured about 33 mm. The relation between the length of the rostrum and carapace of the specimens from 59-63 mm in length ranges between 2 and 2.3, that of the specimen of 48 mm is 1.6 and that of Kemp's specimen is 1.2. In the four large specimens the relation between the length of the carpus and the chela of the first pereiopod ranges between 2.7 and 2.9, in the specimen of 48 mm it is 2.3, in Kemp's specimen of 33 mm it is 2.3 too. Yu's specimens therefore must be considered only to be older specimens of *Palaemon annandalei* and are not varietally distinct from it.

Vertical distribution: Kemp's specimen was collected in fresh water at a depth of 5.5 to 7.5 m.

Horizontal distribution: The species is recorded from: Guzan, Korea (Kubo, 1942), Tangkoo near Tientsin (Yu; 1930), Wangpoo River between Shanghai and Woosung (Kemp, 1917, 1918a).

Palaemon (*Exopalaemon*) *styliferus* H. Milne Edwards (fig. 8)

Palemon longirostris H. Milne Edwards, 1837, Hist. nat. Crust., vol. 2, p. 394 (non H. Milne Edwards, 1837, Hist. nat. Crust., vol. 2, p. 392).
Palemon styliferus H. Milne Edwards, 1840, Hist. nat. Crust., vol. 3, p. 638.
Leander longirostris Henderson, 1893, Trans. Linn. Soc. Lond. Zool., ser. 2 vol. 5, p. 439.

Leander longirostris Nobili, 1901c, Boll. Mus. Zool. Anat. comp. Torino, vol. 16 n. 397, p. 3.
Palaemon styliferus Rathbun, 1902b, Proc. U. S. Nat. Mus., vol. 26, p. 51.
Leander longirostris Nobili, 1903, Boll. Mus. Zool. Anat. comp. Torino, vol. 18 n. 452, p. 7.

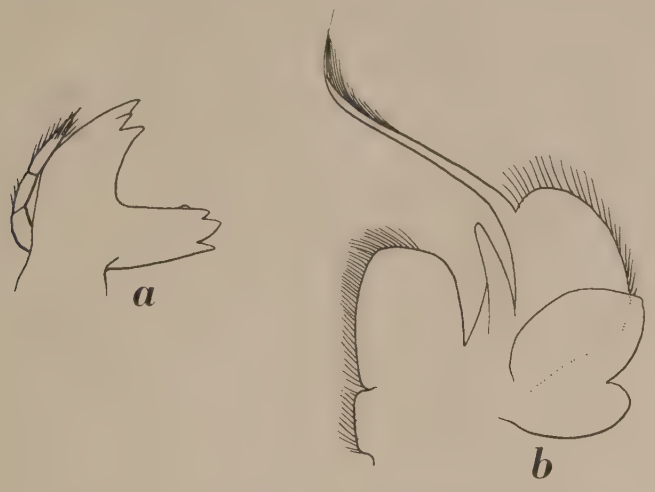

Fig. 8. *Palaemon* (*Exopalaemon*) *styliferus* H. Milne Edw. a, mandible; b, first maxillipede. a, b, × 14.

Leander sp. De Man, 1908, Rec. Indian Mus., vol. 2, p. 220, pl. 18 fig. 3.
Leander styliferus Kemp, 1915, Mem. Indian Mus., vol. 5, p. 273.
Leander styliferus Kemp, 1917, Rec. Indian Mus., vol. 13, p. 124, textfigs. 5, 6a, b, pl. 8 fig. 2.
Leander styliferus Kemp, 1917a, Rec. Indian Mus., vol. 13, p. 234.
Leander styliferus Kemp, 1925, Rec. Indian Mus., vol. 27, p. 289.
Leander styliferus Balss, 1930, Ergebn. Biol., vol. 6, p. 316.
Leander styliferus Rai, 1933, Journ. Bombay nat. Hist. Soc., vol. 36, p. 886.
Leander styliferus Panikkar, 1937, Journ. Bombay nat. Hist. Soc., vol. 39, p. 345.
Palaemon styliferus Suvatti, 1937, Check List aq. Fauna Siam, p. 50.
Leander styliferus Chopra, 1939, Journ. Bombay nat. Hist. Soc., vol. 41, p. 223, pl. 2 fig. 1.
Leander styliferus Chopra, 1943, Indian Sci. Congr., vol. 30 pt. 2 sect. 6, p. 5.

Museum Leiden

Batavia; 1896; leg. A. Vorderman. — 3 ovigerous females 78-92 mm.
Bay of Batavia; March, 1925; leg. P. Buitendijk. — 4 specimens 40-52 mm.
Off Semarang, northcoast of Central Java; April, 1911; leg. P. Buitendijk. — 1 specimen 40 mm.

Museum Amsterdam

Dhappa near Calcutta; slightly brackish water; coll. J. G. de Man. — 6 juvenile specimens 14-16 mm.

The oral parts of *Palaemon styliferus* show no important differences from those of *Palaemon tenuipes*. The mandible (fig. 8a) is somewhat stouter in shape. The palps of the maxillula, maxilla and first maxillipede show no hairs, but these may be worn off. Furthermore the upper lobe of the epipod of the first maxillipede (fig. 8b) is more rounded.

The specimens from the Leiden Museum, which were inserted in the collection under the

name "*Leander longirostris*, Say" agree in all respects with Kemp's (1917) description and figures.

The specimens from the Amsterdam Museum belong to those described by De Man (1908) as *Leander* sp.

Vertical distribution: The species lives in shallow coastal waters, salt as well as brackish; Kemp (1917) records it also from fresh water.

Horizontal distribution: Karachi (Henderson, 1893; Rathbun, 1902b), Keti, near Karachi (Kemp, 1917), Bombay (Nobili, 1903; Kemp, 1917; Rai, 1933), Malabar Coast (Panikkar, 1937), Chilka Lake, Orissa Coast (Kemp, 1915, 1917), Gangetic Delta (H. Milne Edwards, 1837; Kemp, 1917), Sunderbunds, Gangetic Delta (Henderson, 1893), Dhappa near Calcutta (De Man, 1908), Chittagong (Kemp, 1917), Gulf of Martaban (Henderson, 1893), mouths of Yé River and Rangoon River, Burma (Kemp, 1917), Rangoon (Kemp, 1917), Haingyi Island and Green Island, Tennasserim (Kemp, 1917), Mergui Archipelago (Henderson, 1893; Kemp, 1917), near Paknam, Siam (Suvatti, 1937), Bang-pa-Kong River and Bang-pla-soi, Siam (Suvatti, 1937), Singgora, Siamese Malay States (Suvatti, 1937), Pulu Burong, Sarawak (Nobili, 1901c). The species is now recorded for the second time from the Malay Archipelago.

Palaemon (*Exopalaemon*) *carinicauda* nom. nov. (fig. 9)

Leander longirostris carinatus Ortmann, 1890, Zool. Jb. Syst., vol. 5, p. 521.
Leander carinatus Doflein, 1902, Abh. Bayer. Akad. Wiss., vol. 21, p. 639, pl. 3 fig. 8.
Leander styliferus carinatus Balss, 1914, Abh. Bayer. Akad. Wiss., suppl. vol. 2 pt. 10, p. 57.
Leander carinatus Kemp, 1917, Rec. Indian Mus., vol. 13, p. 219, figs. 6c, d.
Leander carinatus Parisi, 1919, Atti Soc. Ital. Sci. nat., vol. 58, p. 77, pl. 4 fig. 3, pl. 6 figs. 8, 9.
Palaemon (*Leander*) *carinatus* Gee, 1925, Lingnaam agric. Rev., vol. 3, p. 158.
Leander carinatus Kemp, 1925, Rec. Indian Mus., vol. 27, p. 289.
Palaemon carinatus Sowerby, 1925, Nat. Note-Book in China, p. 133.
Leander carinatus Urita, 1926, Dobuts. Zasshi, vol. 38, p. 428.
Leander carinatus Yu, 1930a, Bull. Soc. zool. France, vol. 55, p. 556.
Leander carinatus Yoshida, 1941, Bull. Fish. Exper. Sta. Tyôsen, n. 7, p. 28, pl. 7 fig. 2.
Leander carinatus Kubo, 1942, Journ. Imp. Fish. Inst. Tokyo, vol. 35, p. 62, figs. 14C, 16B, 17, 18, 19K, V, 20M, 21K, 22L, 23Q, V, 24K, V, 25M, M', 26 M, W, 27I, T, 28I, R, 29K, 33.

Museum Leiden

Hongkong; June 5, 1917; leg. P. Buitendijk. — 1 specimen 71 mm.

The specimen agrees in all respects with Kemp's (1917) description. The rostrum in my specimen is undamaged, it bears one subapical dorsal tooth. The palm shows a distinct groove on the dorsal surface, as is already described by Parisi (1919); this groove, however, only is visible when the chela is taken out of the spirit and is superficially dried. The mandible has the palp three-jointed as in the other species of the present subgenus, but the division between the first and second joint is not very distinct. The maxillula possesses a spine near the tip of the lower lobe of the palp. The maxilla does not differ in shape from that of *P. tenuipes*. Also the first maxillipede (fig. 9a) resembles that of *P. tenuipes*, only the upper lobe of the epipod is more rounded. The second maxillipede is typical in shape. The first pleopod of the male is figured here (fig. 9b).

The present form first was described as new under the name *Leander longirostris carinatus* Ortmann (1890). Afterwards it is generally considered to be a distinct species. Its name at present should have to be *Palaemon carinatus* (Ortmann, 1890), this name, however, is preoccupied by the

name *Palaemon carinatus* Olivier (1811). A new name therefore is needed, for which I propose *Palaemon* (*Exopalaemon*) *carinicauda* nom. nov.

Vertical distribution: *Palaemon carinicauda* is a form of superficial, probably brackish, waters.

Horizontal distribution: The species is recorded in literature from: Korea (Yoshida, 1941; Kubo, 1942); China (Ortmann, 1890), N. China (Sowerby, 1925), Chingwangtao (Yu, 1930a), Peitaiho (Yu, 1930a), Tientsin (Yu, 1930a), Tsingtao (Doflein, 1902; Balss, 1914; Urita, 1926; Yu, 1930a), Pai-chii (Yu, 1930a), Chung-ming (Yu, 1930a), Shanghai (Parisi,

Fig. 9. *Palaemon* (*Exopalaemon*) *carinicauda* nom. nov. a, first maxillipede; b, first pleopod of male. a, b, × 14.

1919; Yu, 1930a), Ningpo (Kemp, 1917), Southern China (Parisi, 1919), Singapore (Balss, 1914). Hongkong, from which locality the specimen of the Leiden Museum originates, is the southernmost locality from which the species is known, since according to Kemp (1917), Balss's record from Singapore is doubtful.

Palaemon (*Exopalaemon*) *orientis* nom. nov.

Leander longirostris japonicus Ortmann, 1890, Zool. Jb. Syst., vol. 5, p. 519, pl. 37 fig. 14.
Leander longirostris japonicus Doflein, 1902, Abh. Bayer. Akad. Wiss., vol. 21, p. 639.
Palaemon japonicus Rathbun, 1902b, Proc. U. S. Nat. Mus., vol. 26, p. 50 (non De Haan, 1841).
Leander japonicus Balss, 1914, Abh. Bayer. Akad. Wiss., suppl. vol. 2 pt. 10, p. 58.
Leander japonicus Kemp, 1917, Rec. Indian Mus., vol. 13, p. 205, 221 (footnote).
Leander japonicus Parisi, 1919, Atti Soc. Ital. Sci. nat., vol. 58, p. 77, pl. 6 fig. 10.
Palaemon japonicus Urita, 1921, Dobuts. Zasshi, vol. 33, pp. 214-220.
Palaemon japonicus Maki & Tsuchiya, 1923, Rep. Dept. Agric. Formosa, vol. 3, p. 53, pl. 2 fig. 4.
Palaemon (*Leander*) *japonicus* Gee, 1925, Lingnaam agric. Rev., vol. 3, p. 158.
Leander japonicus Kemp, 1925, Rec. Indian Mus., vol. 27, p. 289.
Palaemon japonicus Sowerby, 1925, Nat. Note-Book China, p. 133.
Palaemon (*Leander*) *japonicus* Kellogg, 1929, Lingnan Journ. Sci., vol. 5, p. 352.
Leander japonicus Yu, 1930a, Bull. Soc. zool. France, vol. 55, p. 553.
Leander japonicus Kubo, 1937, Bull. Japan. Soc. sci. Fish, vol. 5, p. 346, figs. 2 K, 2 L, 3 R, 3 S.

Leander japonicus Yoshida, 1941, Bull. Fish. Exper. Sta. Tyôsen, n. 7. p. 28, pl. 7 fig. 1.
Leander japonicus Kubo, 1942, Journ. Imp. Fish. Inst. Tokyo, vol. 35, p. 57, figs. 14A, B, 15, 16C, 17, 19J, U, 20L, 21L, 22K, 23P, U, 24J, U, 25L, L', 26L, V, 27J, U, 28H, S, 29J, 33.

As already shown by Rathbun (1902b) the present species belongs in the genus *Palaemon* Fabr., therefore its name accordingly should become *Palaemon japonicus*; this name, which is used by Rathbun and some other authors, is, however, preoccupied by the much older name *Palaemon japonicus* De Haan (1849) for the species known at present as *Macrobrachium japonicum* (De Haan). As thus the name *japonicus* may not be used for the present species and no other specific name is available, a new name is needed, for which I propose the name *Palaemon orientis* nom. nov.

The present species is very insufficiently known, the original description is very short and illustrated by a rather poor figure. Rathbun (1902b) gives some additional details, one of which, however, is in contradiction with Ortmann's description. Rathbun (p. 51) namely states: "*P. japonicus* has no dorsal spines on the rostrum except at the base, while *P. styliferus* has 2 or 3 on the terminal half". Ortmann's description of the rostrum runs as follows: "Der aufwärts gebogene Theil oben ganz zahnlos, nur dicht vor der Spitze findet sich oft ein winziger Zahn", in the accompanying figure this subapical tooth is distinctly visible. Either Rathbun's specimens do not belong to the species of Ortmann, or the character of the presence or absence of the subapical tooth is variable in the present species. Of the later authors only Parisi (1919) gives a good figure of the second pereiopod, which differs rather much from Ortmann's figure. A good description of the species thus is badly needed, and examination of the material examined by the various authors perhaps will prove that the specimens, brought by them to the present species, belong to different forms.

Horizontal distribution: The species is recorded in literature from Japan, China and Formosa. These records are: Japan: ? Hakodate, Hokkaido (Doflein, 1902), Matsushima near Sendai, Hondo (Rathbun, 1902b), Tokyo Bay (Ortmann, 1890; Balss, 1914), Fukugawa, Tokyo (Kubo, 1942), Enoshima, Sagami Bay (Rathbun, 1902b), Lake Hamana and Yosida (Kubo, 1942), Tsu (Balss, 1914), Fukuyama, Hondo (Kubo, 1942), Kawatana and Nagasaki, Kyushyu (Rathbun, 1902b). Korea (Yoshida, 1941; Kubo, 1942). China: Tsingtao (Urita, 1921), Hankow (Balss, 1914; Kellogg, 1929), Foochow (Gee, 1925; Kellogg, 1929), Fukien (Gee, 1925). Formosa: Formosa (Maki & Tsuchiya, 1923), Tamsui (Parisi, 1919), Takao (Balss, 1914).

Palaemon (Exopalaemon) macrogenitus (Yu)

Leander macrogenitus Yu, 1930a, Bull. Soc. zool. France, vol. 55, p. 559, fig. 1.

Yu (1930) gave the following differences between this and the next species:

1. The fingers of the second leg in *P. macrogenitus* are as long as the palm, while in *P. modestus* they are longer than the palm.

2. In *P. macrogenitus* the first two teeth of the upper margin of the rostrum are placed behind the posterior limit of the orbit, in *P. modestus* there should be only one tooth behind the orbital margin.

3. The ovae of *P. macrogenitus* are larger than those of *P. modestus*.

The first of the above differences between the two species is very small, so that it hardly can be considered to be of specific value, the relation between the length of the fingers and that of the palm in *P. macrogenitus* according to Yu is 1, while that relation in *P. modestus*, according to

Kemp (1917) varies between 1.1 and 1.2. The second character too is of no importance since Kemp (1917) remarks that in *P. modestus* of the teeth of the upper margin of the rostrum "one or two are situated on the carapace behind the orbit". As Yu gives measurements of the ovae of neither *P. macrogenitus* nor of those of *P. modestus,* one can form no opinion about the importance of this character. I think it very probable, that if no other differences are found, the species have to be fused, the more as *Palaemon macrogenitus* is known only from one specimen, which is collected at Hangchow, a locality from where *P. modestus* is recorded too and which is situated in the centre of the range of distribution of that species. Kubo (1942) synonymizes the two forms.

Palaemon (*Exopalaemon*) *modestus* (Heller) (fig. 10)

Leander modestus Heller, 1862a, Verh. zool.-bot. Ges. Wien, vol. 12, p. 527.
Leander modestus Heller, 1865, Reise Novara, vol. 2 pt. 3, p. 111, pl. 10 fig. 6.
Leander spec. Czerniavsky, 1878, Trav. Soc. Nat. Petersb., 1878, p. 23.
non *Leander modestus* Henderson, 1893, Trans. Linn. Soc. Lond. Zool., ser. 2 vol. 5, p. 441.
Leander czerniavskyi Brashnikov, 1907, Mem. Acad. Sci. Petersb., ser. 8 vol. 20 pt. 6, p. 176.
Leander modestus var. *sibirica* (Czerniavsky MSS) Brashnikov, 1907, Mem. Acad. Sci. Petersb., ser. 8 vol. 20 pt. 6, p. 176.
Leander modestus Kemp, 1917, Rec. Indian Mus., vol. 13, p. 221, pl. 9 fig. 1.
Leander modestus Kemp, 1918a, Mem. Asiat. Soc. Bengal, vol. 6, p. 268.
Palaemon (*Leander*) *modestus* Gee, 1925, Lingnaam agric. Rev., vol. 3, p. 158.
Leander modestus Kemp, 1925, Rec. Indian Mus., vol. 27, p. 289.
Palaemon modestus Sowerby, 1925, Nat. Note-Book in China, p. 133.
Leander czerniavskyi Derjavin, 1930, Hydrobiol. Zeitschr. biol. Wolga Sta., vol. 9, p. 2.
Leander modestus Yu, 1930a, Bull. Soc. zool. France, vol. 55, p. 558.
Leander modestus Ping, 1932, Peking nat. Hist. Bull., vol. 7, p. 169.
Leander czerniavskyi Buldovsky, 1933, Bull. Far East. Br. Acad. Sci. U.S.S.R., 1933, p. 47, pl. 2 figs., 18, 19, 22.
Leander czerniavskyi lacustris Buldovsky, 1933, Bull. Far East. Br. Acad. Sci. U.S.S.R., 1933, p. 47, pl. 2 figs. 21, 23.
Leander czerniavskyi Birstein & Vinogradov, 1934, Zool. Journ. Moscow, vol. 13, p. 44, figs. 2 A, B.
Leander modestus Birstein & Vinogradov, 1934, Zool. Journ. Moscow, vol. 13, p. 44, figs. 2 C, D.
Leander modestus Uéno, 1935, Trans. nat. Hist. Soc. Formosa, vol. 25, p. 274, figs. 3, 4.
Leander modestus Birstein, 1939, Zool. Journ. Moscow, vol. 18, p. 61.
Leander modestus Kubo, 1940d, Kantôsyu oyobi Mansyûkoku Rikusui, p. 271, figs. 1, 2.
Leander modestus Birstein, 1941, Life Freshw. U.S.S.R., vol. 1, p. 424, pl. 222 fig. 10.
Leander modestus Kubo, 1942, Journ. Imp. Fish. Inst. Tokyo, vol. 35, p. 55, figs. 16A, 19I, T, 20K, 21M, 22M, 23O, T, 24I, T, 25H, H', 26K, U, 27H, S, 28G, Q, 29H, 32.

Museum Leiden

Ahan, South Formosa; December 1-10, 1907; leg. H. Sauter (n. 16953). — 1 juvenile specimen 25 mm.

Museum Amsterdam

Tai Hu, Kiangsu Province, China; December, 1915; leg. N. Annandale; coll. J. G. de Man. — 3 specimens 45-56 mm.
Marsh near Tientsin, China; May, 1909; leg. A. Hüllmann. — 1 specimen 58 mm.

As the present species has to be placed in the genus *Palaemon* its name becomes *Palaemon modestus* (Heller). De Man (1892) described a species of *Macrobrachium* under the name

Palaemon modestus. As the name *modestus* of Heller (1862a) is older than that of De Man, the latter has to be changed. It is named here (vid. p. 198) *Macrobrachium sophronicum* nom. nov.

Leander czerniavskyi Brashnikov (1907) is identical with the present species. I give here a translation of Brashnikov's Russian description of *Leander czerniavskyi*. For this translation I am much indebted to Mr. A. Kroonenberg.

"The carapace has the dorsal keel starting about at the middle of its length, in the beginning this keel is hardly noticeably curved at all, but almost immediately behind the orbit the keel is elevated to a rather high crest, which continues into the lamella of the rostrum. The midrib of the rostrum is strong and straight (in larger specimens it sometimes it slightly curved upwards) and reaches in situ to the end of the scaphocerite, sometimes, however, it reaches beyond the scaphocerite. The anterior third (sometimes less) of the midrib of the rostrum is deprived of the upper and lower lamellae as well as of teeth. The rostral formula runs as follows:

$$1+\frac{6-10}{1-5}+1$$

The peduncles of the antennulae reach almost the tip of the final tooth of the scaphocerite, their two flagella, which have the 6 lower joints fused, are unequal in length; the external flagellum is almost twice as long as the internal, the latter being hardly longer than the rostrum, the former being about as long as the thick flagellum (= antennal flagellum); the free part of the shorter, slender, flagellum consists of 13 to 15 joints. The apex of the antennal peduncle reaches about to the middle of the outer margin of the scaphocerite. The tip of the third maxillipede reaches about to the end of the antennal peduncle. The first pereiopods in situ are longer than the third maxillipedes and reach the end of the antennulae. The second pereiopods are more robust and longer, they reach beyond the final tooth of the scaphocerite (with less than the length of their fingers); the hand is somewhat thickened when compared with the carpus, and is distinctly longer than the latter (with about 1/3 of its length). The length of the fingers is somewhat more than half the full length of the chela. The third to fifth pereiopods are slender and almost naked; the fifth pereiopods in situ reach almost to the tip of the final tooth of the scaphocerite. The telson is distinctly shorter than the uropods; two to three pairs of spines are present on the lateral margins."

Brashnikov himself already pointed to the close relationship between the two forms and justified the erection of a new species for his specimens mainly on the fact that they were collected in localities geographically far distant and climatologically strongly different from that of Heller's specimen. According to Brashnikov the description of Heller is too short to bring final certainty in the matter of the identity or distinctness of the two forms. Kemp (1917) gives a detailed description and a good figure of "*Leander*" *modestus* from Shanghai (the typelocality of the species), while Birstein & Vinogradov (1934) give figures of Brashnikov's type-specimens. Comparison of Kemp's description and figure with the description and figures of Brashnikov's specimens distinctly shows that the two forms are identical. Apart from the specimens identified as *Leander czerniavskyi*, Birstein & Vinogradov (1934) also mentioned specimens under the name *Leander modestus*. These specimens differ from the *L. modestus* of Kemp by having the rostrum shorter and the telson more blunt. According to Kemp the character of the length of the rostrum is variable with age, the young specimens possess "a shorter rostrum, often not

reaching beyond the end of the antennular peduncle." In his 1939 paper Birstein also comes to the conclusion that *L. czerniavskyi* and *L. modestus* are identical. The difference in the shape of the rostrum and the telson of the *L. modestus* and *L. czerniavskyi* specimens of Birstein and Vinogradov (1934), according to Birstein (1939) are due to ecological factors only: "This species shows a large variability, due to ecological factors, which is especially distinctly shown in the shape and armament of the rostrum and the shape of the apex of the telson: the typical form, with the short straight rostrum and the blunt telson, lives in calmly flowing water, in stagnant water lives the form with the elongate upwards curved rostrum, acute telson and longer antennae and pereiopods. It is this latter form, which is described and figured by Kemp from near Shanghai as the typical *L. modestus*, while he ascribes the characters of the first form to juvenile specimens (15-25 mm)" [1]). Further Birstein (1939) points out that Buldovsky's *Leander czerniavskyi* ssp. *lacustris* is identical with the form from stagnant water.

In his paper on freshwater Decapoda from Formosa Uéno (1927) gave the following account of *Leander modestus* [2]):

"I found four specimens at Uzanto, and one specimen at Zitugetutan. The material is insufficient for dealing with the mutual variations; we may note, however, some differences with the typical *Leander modestus*. As first difference must be mentioned the fact that the apex of the rostrum is extremely short (fig. 3A), as is clearly shown by comparison with the rostrum of *L. modestus* from the Tai Lake in China (fig. 4). Kemp (1917, p. 223) states that the rostra of young specimens are short, but one of the specimens from Uzanto certainly is no juvenile specimen, as it, though being very small (24 mm), is provided with ova. The number of teeth on the dorsal margin of the rostrum is 5 to 8 (in one specimen 10), 2 to 3 of which are placed behind the anterior margin of the carapace. The number of teeth on the lower margin of the rostrum is 3 (Kemp states 2-4), the specimen from Zitugetutan, however, differs from the rest in having only one ventral tooth. The tip of the rostrum is very acute and never possesses, as may be observed in *C.* [*aridina*] *nilotica*, small subapical teeth. The carpus of the first leg is somewhat longer than the merus and slightly shorter than twice the length of the propodus (fig. 3B). According to Kemp's description the carpus is somewhat longer than twice the length of the propodus. The propodus of the second leg is about as long as the carpus (fig. 3C). The third to fifth pereiopods are very long and narrow, the third leg being shortest. The propodus of the third leg is about 1.5 times as long as the carpus and slightly shorter than in Kemp's specimen, the dactylus is as long as the carpus. The dactylus of the fifth pereiopod is about as long as or slightly shorter than the carpus, the latter being slightly longer than half the propodus. This relation between the lengths of the various joints differs from those of Kemp's specimen, especially the short propodus is noteworthy.

The various differences mentioned, especially the shape of the rostrum, the relation between the lengths of the joints of the legs etc. give the impression that it should be justified to separate the specimens from Formosa and to place them in a new species. The decision over this question, however, better may be postponed till a large number of specimens can be examined.

The specimens of *L. modestus* from the Tai Lake, China, which are used for comparison, have been collected by the teacher Kawamurada Saneji in December, 1917 and are preserved

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1) The translation of this part of Birstein's article (1939, p. 61) I owe to Mr. A. Kroonenberg.
2) I am much indebted to Miss M. Snellen for the translation of this Japanese text.

at the Limnological laboratory at Otsu. The length of the specimens is 30-47 mm, generally 38-42 mm, thus being much larger than those from Formosa. The number of teeth on the rostrum is about as follows:

Table 3. *Leander modestus* (from the Tai Lake, China): the number of teeth on the rostrum

Number of dorsal teeth	number of specimens	number of ventral teeth	number of specimens
11	3	4	10
10	10	3	12
9	10	2	5
	5		

Commonly the teeth on the ventral margin are placed somewhat before the extreme tooth of the dorsal margin (fig. 4A) and Kemp's (1917, pl. 9 fig. 1) figure is in agreement herewith. Some, however, as is shown in figure 4 B, are placed far posteriorly."

My specimen from Formosa, a non-ovigerous female, agrees good with the characters mentioned by Uéno. The differences in the relation between the lengths of the joints of the pereiopods of this specimen and of the typical *P. modestus* are, however, extremely small. Here in all probability the differences also may be due to ecological factors (and perhaps to difference in age).

The Chinese specimens at my disposal entirely agree with Kemp's description. The specimens from Shanghai even formed part of the material on which Kemp based his description.

The oral parts of the present species closely resemble those of *P. tenuipes*. The first maxillipede

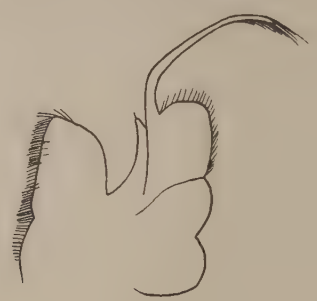

Fig. 10. *Palaemon* (*Exopalaemon*) *modestus* (Heller). First maxillipede. × 14.

(fig. 10) is figured here for comparison with Sollaud's (1914) figure of that appendage of *Palaemon mani* and with that of Yu (1930) of *Palaemon macrogenitus*. In my opinion one may not attach too much value to the shape of the epipod of the first maxillipedes, as it is membranaceous and therefore easily deformable.

As already remarked by Kemp (1918a) the specimens brought by Henderson (1893) to the present species in reality belong to *Palaemon semmelinkii* (De Man).

Vertical distribution: The species lives in shallow (5.5-7.5 m) fresh water.

Horizontal distribution: The species is recorded in literature from the following localities: Upper Tungush River, Amur basin (Czerniavsky, 1878; Brashnikov, 1907), mouth of the Amur River (Brashnikov, 1907; Birstein & Vinogradov, 1934), Tyr on the Amur River (Brashnikov, 1907), Khanka Lake, Ussur Province (Derjavin, 1930; Buldovsky, 1933; Birstein & Vinogradov, 1934; Kubo, 1940d), Daubicha, Ussur basin (Birstein &

Vinogradov, 1934), Suifun basin near Vladivostoc (Derjavin, 1930; Birstein, 1939), Daila Nor, Manchuria (Kubo, 1940d), Harbin, Manchuria and Rakutôkô River, Korea (Kubo, 1942), Pai-chii, China [1]) (Yu, 1930a), Shanghai, Kiangsu province (Heller, 1862a, 1865), Whangpoo River near Shanghai, Kiangsu province (Kemp, 1917, 1918a), Taihu Lake, Kiangsu province (Kemp, 1917, 1918a; Uéno, 1935), Soochow, Kiangsu province (Yu, 1930a), Hangchow, Chekiang province (Yu, 1930a), Yochow, Hunan province (Ping, 1932; Kubo, 1942), Fukien province (Sowerby, 1925), Ihing [1]) and Kinkiang [1]) (Yu, 1930a), Formosa (Uéno, 1935). Both Czerniavsky and Brashnikov thought the type specimens of *Leander czerniavskyi* to orginate from the Upper Tungush river in Central Siberia, but as Birstein (1939) pointed out, they certainly come from the Tungush river in eastern Siberia, which is a tributary of the Amur river.

Subgenus **Palaeander** nov.

The present new subgenus closely resembles *Palaemon* s.s., but differs from it by having the mandibular palp two-jointed instead of three-jointed, a character which shows to be very constant and in other groups often is of generic value. In the present case the difference only may be considered to be of subgeneric value as it is not accompanied by other differences. Five species at present are known to belong to the present subgenus, these species are: *Palaemon elegans* Rathke (the type of the subgenus), *Palaemon semmelinkii* (De Man), *Palaemon floridanus* Chace, *Palaemon maculatus* (Thallw.) and *Palaemon northropi* (Rankin).

Only *Palaemon semmelinkii* is represented in the collection at hand, but *P. elegans,* though being a European species, is dealt with here too.

Palaemon (*Palaeander*) *elegans* Rathke, 1837

No references are given here, as a complete synonymy of the present species would fall out of the scope of the present paper.

Palaemon elegans Rathke in modern carcinological literature is better known under the name *Palaemon* (or *Leander*) *squilla.* The species described by Linnaeus (1758) as *Cancer Squilla,* however, is not identical with the present form but with the species best known as *Palaemon* (or *Leander*) *adspersus* Rathke. Linnaeus namely gives the following description of his *Cancer Squilla*:

"C.[ancer] macrourus, thorace lævi, rostro supra serrato subtus tridentato, manuum digitis aequalibus. *Fn. svec.* 1252.

Matth. diosc. 229. *Rond. pisc.* 549.

Klein. dub. 35. *f. A.*

Habitat in M. Balthico, *Oceano* Europæo."

Linnaeus's definition fits for *Leander squilla* auctt. as well as for *Leander adspersus,* but the references to literature and the distribution show the real identity of Linnaeus's species. In Fauna Suecica (Linnaeus, 1746) the description though somewhat more extensive than in Systema Naturae, gives no further decisive characters: "Rostrum lanceolatum, perpendiculare, acutum, supra octo crenis, infra tribus serratum; manus, quae tertio pedum pari insident, digitis sunt aequalibus."

1) The exact situation of this locality is unknown to me.

But the indication "Habitat in mari *Balthico*" excludes the possibility that this form is identical with *Leander squilla* auctt., as the latter does not occur in the Baltic Sea. Matthioli (1565) gives three good figures of his "Squilla", which, by the fact that only the first tooth of the rostrum is situated on the carapace behind the orbit and by having long and slender fingers at the chela of the second legs, distinctly must belong to *Leander adspersus* and not to *Leander squilla* auctt., as the latter has the first three teeth of the rostrum placed behind he orbit and has the fingers of the chela of the second legs very short. Klein's (1754) *Squilla fusca,* which was collected at Danzig, only can be *Leander adspersus,* as *Leander squilla* auctt. does not occur there. Klein's figure of *Squilla fusca* is very poor. Rondelet's (1554) *Squilla gibba* is a species incerta, the description as well as the figure are insufficient to make the identity of the species certain; it might be *Palaemon serratus.* Because the species recognizable from the references all are *Leander adspersus* and as Linnaeus mentions in his description for *Cancer Squilla* "*Habitat in M.* Balthico" and as *Leander squilla* auctt. does not occur in the Baltic, we only can come to the conclusion that *Cancer Squilla* is identical with *Leander adspersus.*

According to Balss (1926) and Schellenberg (1928) *Leander squilla* auctt. has been found in the western Baltic Sea as far as Rügen and the Danzig Bight. These statements, however, are incorrect. They are based on the records of Möbius and Seligo, who both do not separate *Leander squilla* auctt. and *Leander adspersus.* Zaddach (1844) described the only species of *Palaemon* occurring at Danzig as *Palaemon rectirostris,* which later is recognized to be identical with *Leander adspersus.* Important also is a footnote in the paper of Ehrenbaum (1898, p. 107), in which he reviews Mortensen's paper on the larval development of *Palaemon Fabricii* (= *Leander adspersus*): "Auf meine Bitte theilt mir Herr Prof. Brandt-Kiel, freundlichst mit, dass bezüglich der Benennung der Palaemoniden der westlichen Ostsee offenbare Verwirrung herrscht. Was die dänischen Forscher Meinert und Mortensen *Palaemon Fabricii Rathke* nennen, ist früher von Moebius — vermuthlich irrthümlich — als *Palaemon squilla L.* gedeutet worden, müsste aber unter Berücksichtigung der Priorität, wie Ortmann feststellt (Spengels zoolog. Jahrb. Abth. f. Systematik V. 1891 S. 512 und 524), wahrscheinlich richtiger bezeichnet werden als *Leander adspersus Rathke.* Garneelen von Kiel und Kappel, die in neuerer Zeit von Brandt, Dahl, Vanhöffen und auch von Ortmann untersucht wurden, sind sicher keine *squilla,* sondern entsprechen vollkommen der Diagnose von Ortmann für *Leander adspersus.* Professor Brandt bezweifelt, das *Palaemon squilla L.* überhaupt südlich von den Belten vorkomt; im Kattegat ist dieselbe jedoch nach Meinerts Angabe vorhanden. Demnach wird die Garneele der westlichen Ostsee und auch der dänischen Gewässer am richtigsten mit dem wissenschaftlichen Namen *Leander adspersus Rathke* bezeichnet." Entirely agreeing with this statement is the record of Lagerberg (1908) that *Leander squilla* auctt. occurs along the Swedish coast from Bohuslån to Skåne, thus only at the westcoast, while *Leander adspersus* is found as well on the westcoast as on the eastcoast; on the eastcoast it is found as far northward as Stockholm.

As *Cancer Squilla* L. is identical with *Palaemon adspersus* Rathke, that species has to bear the name *Palaemon squilla* (L.), while the species known best as *Leander squilla* must be named *Palaemon elegans* Rathke.

The fact that the specific name *squilla* generally is given to the wrong species probably is due to the fact that Leach in his Podophthalmia Britannica gave a very good figure of *P. elegans,* which he named *P. squilla.* As Leach's work at that time was a standardwork, he is followed in this error

by numerous other authors, among which Bell (1844-1853) in his highly important work on the British stalk-eyed Crustacea and De Man (1915a) in his revision of the European species of the genus *Leander*.

In 1875 Paulson described a new species of *Palaemonella, P. gracilis,* from the Red Sea. His species, however, does not belong to the Pontoniinae but to the Palaemoninae as is shown by the presence of two pairs of spines and one pair of feathered setae at the posterior margin of the telson and by the presence of a branchiostegal and the absence of a hepatic spine. Paulson's species in all respects agrees with *Palaemon elegans* Rathke, it possesses a two-jointed mandibular palp, there are three teeth of the upper margin of the rostrum situated behind the orbit, the shape of the rostrum also closely resembles that of Rathke's species, furthermore the position of the branchiostegal spine, the fact that the shorter ramus of the upper antennular flagellum is fused with the longer ramus for the larger part of its length, and the short fingers of the second legs all are exactly as in *Palaemon elegans*. *Palaemonella gracilis* therefore must be considered a synonym of that species. As *Palaemon elegans* is not known from the indo-westpacific region, it is possible that Paulson's specimen was incorrectly labelled.

De Man (1915a) divided the present species into three forms, namely the typical form and the varieties *intermedia* De Man and *elegans* Rathke. The differences between these forms are so insignificant and the characters upon which the differences are based vary so much in my material, that I can not attach to them any value for separating even varieties.

Palaemon (*Palaeander*) *semmelinkii* (De Man) (fig. 11)

Leander semmelinkii De Man, 1881, Notes Leyden Mus., vol. 3, p. 137.
Leander semmelinkii Ortmann, 1890, Zool. Jb. Syst., vol. 5, p. 517.
Leander modestus Henderson, 1893, Trans. Linn. Soc. Lond. Zool., ser. 2 vol. 5, p. 441 (non Heller, 1862).
Leander Semmelinkii Nobili, 1903a, Boll. Mus. Zool. Anat. comp. Torino, vol. 18 n. 455, p. 8.
non ? *Leander Semmelinkii* Nobili, 1905a, Ann. Mus. nat. Hung., vol. 3, p. 482.
Leander semmelinki Kemp, 1918a, Mem. Asiat. Soc. Bengal, vol. 6, p. 268.
Leander semmelinki Kemp, 1925, Rec. Indian Mus., vol. 27, p. 304.

Snellius Expedition

Kambang; shore and reef; November 26-28, 1929. — 2 specimens (1 ovigerous female) 37 & 41 mm.

Museum Leiden

Off Makassar; 1881; leg. J. Semmelink (cotypes). — 48 specimens (included ovigerous females) 23-38 mm.
Makassar; January, 1880; leg. J. Semmelink. — 3 specimens 31-32 mm.
Belawan Deli, eastcoast of Sumatra; November 1926; leg. P. Buitendijk. — 15 specimens (included 2 ovigerous females) 24-35 mm.
Northcoast of Java near Tandjong Priok; 1906; leg. P. Buitendijk. — 1 specimen 29 mm.
Tandjong Priok, near Batavia; May, 1924; leg. P. Buitendijk. — 9 specimens (included ovigerous females) 22-33 mm.
Mangroves near Antjol, coast near Batavia; July 15, 1938; leg. F. P. Koumans. — 1 specimen 27 mm.
Fishpond near the Laboratorium voor Onderzoek der Zee (Laboratory for Marine Investigations), Batavia; July 18, 1938; leg. F. P. Koumans. — 1 specimen 41 mm.

Museum Amsterdam

Off Makassar; 1881; leg. J. Semmelink (cotypes). — 2 specimens (1 ovigerous female) 25 & 36 mm.

Description: The rostrum (figs. 11a, b) is straight, with the tip curved upwards, it reaches with 1/5 to 1/3 of its length (1/3 to almost 1/2 in the males) beyond the scaphocerite. The upper margin is provided with 7 to 11 (mostly 8 or 9) teeth; the first of these teeth is placed on the carapace behind the orbit, it is more remote from the second tooth than the third is, the second tooth is situated slightly behind or just over the posterior margin of the orbit. The first teeth are more or less distinctly movable, the ultimate 2 or 3 teeth are immovable (in the specimen with 11 dorsal teeth there are three more teeth immovable). The teeth are placed in the proximal part of the rostrum only: slightly more than the distal third to slightly less than the distal half of the rostrum is entire; there is no subapical tooth near the apex of the rostrum. The lower margin of the rostrum bears 2 to 5 (almost always 3) teeth, here too the distal part is entire. The setae of the upper as well as of the lower margin of the rostrum are arranged in a single row. In the males the rostrum is more slender than in the females, the teeth, especially the distals, are longer and more pressed against the rostrum proper. The carapace has the branchiostegal spine slightly smaller than the antennal; it is placed on the anterior margin of the carapace.

The abdominal pleurae are normal in shape. The sixth segment is about 1.5 times as long as the fifth.

The telson is distinctly longer than the sixth abdominal segment. Of the two dorsal pairs of spines the anterior is situated in the middle of the telson, the place of the posterior pair is rather variable, mostly it is situated midway between the anterior pair and the posterior margin of the telson, sometimes, however, it is placed closer to the anterior spines, sometimes closer to the posterior margin. The posterior margin ends in a sharp median point, and is provided with two pairs of spines, the outer of which is about four times as short as the inner; a pair of feathered setae is present between the two inner spines.

The eyes have the cornea distinctly shorter and broader than the eye-stalk. An ocellus is present.

The stylocerite of the basal segment of the antennular peduncle (fig. 11c) is sharp and slender, but just fails to reach the middle of the segment, no dorsal carina is visible on the stylocerite. The outer margin of the basal segment is more or less straight and ends in a strong anterolateral spine, which reaches beyond the middle of the second segment of the antennular peduncle and distinctly overreaches the convex anterior margin of the basal segment. The second segment of the peduncle is distinctly shorter than the third, when measured in dorsal line; together these two segments are slightly shorter than the first. The upper antennular flagellum has the two rami fused for about 7 to 12 joints, the free part of the shorter ramus consists of 11 to 17 joints and is about 1.5 times to twice as long as the fused portion.

The scaphocerite (fig. 11d) is rather broad, it is about thrice as long as broad and reaches with 1/3 of its length beyond the antennular peduncle. The outer margin is straight or slightly convex and ends in a strong final tooth, which is distinctly overreached by the lamella. Some distance above the base the lamella is broadest, it slightly narrows towards the apex.

The oral parts are quite typical for the present genus. The mandibular palp (fig. 11e), however, is two-jointed, for which reason the species is placed in the subgenus *Palaemander*. The epipod

of the first maxillipede is divided into two rounded lobes. The third maxillipede reaches beyond the antennal peduncle. The ultimate segment is somewhat shorter than the penultimate. The antepenulti-

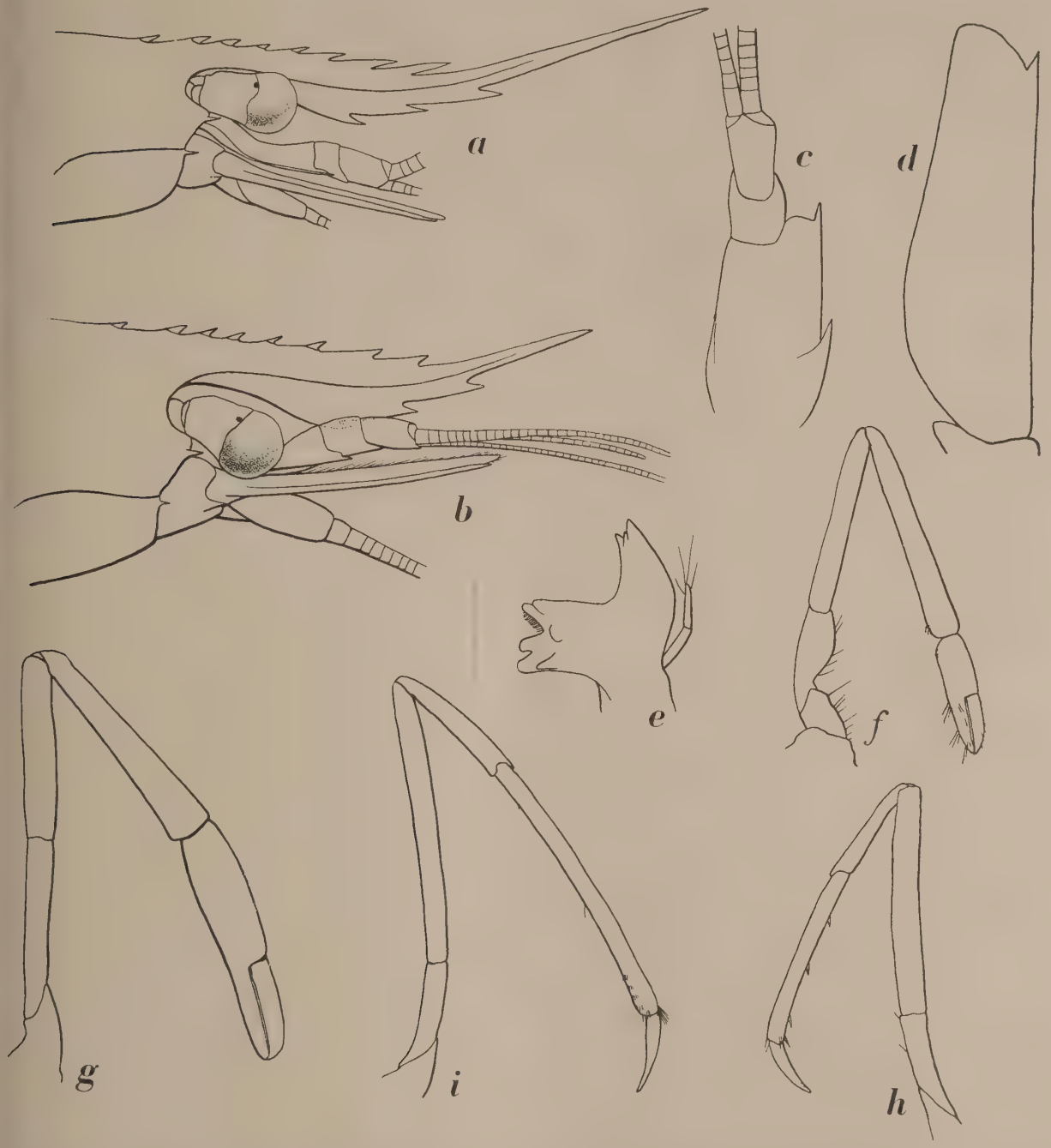

Fig. 11. *Palaemon* (*Palaeander*) *semmelinkii* (De Man). a, anterior part of body of male; b, anterior part of body of female; c, antennular peduncle; d, scaphocerite; e, mandible; f, first pereiopod; g, second pereiopod; h, third pereiopod; i, fifth pereiopod. a, b, × 10; c, d, f-i, × 14;e, × 33.

mate segment is slightly less than twice as long as the ultimate.

The first pereiopod (fig. 11f) reaches somewhat beyond the end of the antennular peduncle,

but fails to reach the end of the scaphocerite. The fingers are as long as the palm, they bear some tufts of setae and have blunt tips. The carpus is somewhat less than twice as long as the chela, it broadens distally. The merus is distinctly shorter than the carpus. The ischium is about half as long as the carpus. The second pereiopods (fig. 11g) are distinctly stronger than the first, they reach with the fingers, sometimes even with half the palm, beyond the scaphocerite. The fingers are slender, they measure about $^2/_3$ of the length of the palm. The cutting edge of the dactylus is provided in its proximal part with a small inconspicuous tooth, the rest of the cutting edge of the dactylus as well as that of the fixed finger is entire. The palm is cylindrical and slightly swollen. The carpus is as long as the chela, sometimes slightly shorter or somewhat longer (Nobili's (1903) statement that the carpus is subequal to the palm probably is an error), it broadens distally. The merus measures about $^4/_5$ of the length of the carpus. The ischium is as long as the merus. All segments of the second leg are unarmed. The third periopod (fig. 11h) reaches about to the end of the antennular peduncle. The propodus measures somewhat less than thrice the length of the dactylus; the posterior margin of the propodus is provided with scattered spinules. The carpus is somewhat more than half as long as the propodus. The merus is much stronger than the propodus and is about as long as the propodus and half the carpus combined. The ischium is half as long as the merus. The fifth pereiopod (fig. 11i) is slender, it reaches almost to the end of the scaphocerite. The propodus is more than thrice as long as the dactylus. The carpus is half as long as the propodus. The merus is about as long as the propodus. The ischium is less than half as long as the merus. The fifth pereiopod resembles the fourth in most respects, it is slightly more slender and reaches farther forwards than the fourth leg. Like in all other species of the genus the fifth leg has transverse rows of setae in the distal part of the posterior margin, these setae are closely packed together, the rest of the posterior margin of the propodus, except for one or two single setae, is naked.

The pleopods are normal in shape. The endopod of the first pleopod of the male is ovate and bears no appendix interna, its inner margin is concave. The appendix masculina of the second pleopod of the male is strong and reaches distinctly beyond the appendix interna.

The uropods are elongate, they are of the normal shape.

The eggs are numerous and small.

The specimens from Berlinhafen, Papua, identified by Nobili (1905a) with some doubt with the present species, certainly do not belong here, as the specimens all have the upper margin of the rostrum provided with a subapical tooth; perhaps the specimens will prove to belong to *Palaemon concinnus* or *P. debilis*.

Distribution: The present species, which inhabits shallow coastal, sometimes brackish, water, is recorded in literature from: Bombay (Kemp, 1925), Bandra near Bombay (Kemp, 1918a), E. of Cacara Pt., Mormugao Bay, Portuguese India (Kemp, 1925), Madras (Henderson, 1893), Ennur backwater near Madras (Kemp, 1918a), Fisher Bay, Port Owen, Tavoy Island, Burma (Kemp, 1918a), Jack and Una Island, Mergui Archipelago (Kemp, 1925), Nancowry Island, Nicobar Archipelago (Kemp, 1925), mouth of Prai River, opposite Penang, Malay Peninsula (Kemp, 1918a), Singapore (Nobili, 1903a), Luzon (Ortmann, 1890), Makassar, Celebes (De Man, 1881).

Subgenus **Palaemon** Fabricius s.s.

This is the largest of the four subgenera of the genus *Palaemon*. The type species is *Palaemon squilla* (L.), which as already pointed out above, is identical with the species best known as *Leander*

adspersus and is different from *Leander squilla* of most authors. Eight species of this subgenus are present in the material examined by me, while moreover some other species of this group are dealt with here too.

Palaemon (*Palaemon*) *concinnus* Dana (fig. 12)

Palaemon concinnus Dana, 1852, Proc. Acad. nat. Sci. Philad., vol. 6, p. 26.
Palaemon exilimanus Dana, 1852, Proc. Acad. nat. Sci. Philad., vol. 6, p. 26.
Palaemon concinnus Dana, 1852a, U. S. Explor. Exped., vol. 13, p. 587.
Palaemon exilimanus Dana, 1852a, U. S. Explor. Exped., vol. 13, p. 586.
Palaemon concinnus Weitenweber, 1854, Lotos Praha, vol. 4, p. 61.
Palaemon exilimanus Weitenweber, 1854, Lotos Praha, vol. 4, p. 61.
Palaemon concinnus Dana, 1855, U. S. Explor. Exped., vol. 13, atlas, p. 12, pl. 38 fig. 10.
Palaemon exilimanus Dana, 1855, U. S. Explor. Exped., vol. 13, atlas, p. 12, pl. 38 fig. 8.
Leander longicarpus Stimpson, 1860, Proc. Acad. nat. Sci. Philad., 1860, p. 40.
Palaemon longicarpis Hilgendorf, 1869, v. d. Decken's Reisen O. Afr., vol. 3 pt. 1, p. 102.
Palaemon (*Leander*) *concinnus* Hilgendorf, 1879, Mber. Akad. Wiss. Berlin, 1878, p. 842.
Leander longicarpus De Man, 1888, Arch. Naturgesch., vol. 53 pt. 1, p. 560.
Leander longicarpus Ortmann, 1890, Zool. Jb. Syst., vol. 5, p. 516.
Leander concinnus De Man, 1892, Weber's Zool. Ergebn., vol. 2, p. 506.
Leander longicarpus Ortmann, 1894, Denkschr. med.-naturw. Ges. Jena, vol. 8, p. 17.
Leander concinnus De Man, 1897, Zool. Jb. Syst., vol. 9, p. 765.
Leander concinnus Coutière, 1900, C. R. Acad. Sci. Paris, vol. 130, p. 1267.
Leander concinnus Coutière, 1901, Ann. Sci. nat. Zool., ser. 8 vol. 12, p. 337, pl. 14 fig. 47.
Leander concinnus De Man, 1902, Abh. Senckenb. naturf. Ges., vol. 25, p. 807.
Leander concinnus Voeltzkow, 1902, Abh. Senckenb. naturf. Ges., vol. 26, p. 564.
Leander concinnus Lenz, 1905, Abh. Senckenb. naturf. Ges., vol. 27, p. 380.
Palaemon concinnus Rathbun, 1910, Bull. Mus. comp. Zoöl. Harv., vol. 52, p. 316.
Leander concinnus J. Roux, 1919, Abh. Senckenb. naturf. Ges., vol. 35, p. 341.
Leander concinnus Tattersall, 1921, Journ. Linn. Soc. Lond. Zool., vol. 34, p. 393.
Leander concinnus Sendler, 1923, Abh. Senckenb. naturf. Ges., vol. 38, p. 46.
Palaemon (*Leander*) *longicarpus* Gee, 1925, Lingnaam agric. Rev., vol. 3, p. 158.
Leander concinnus Kemp, 1925, Rec. Indian Mus., vol. 27, pp. 290, 296.
Leander exilimanus Kemp, 1925, Rec. Indian Mus., vol. 27, p. 291.
Leander concinnus Balss, 1927, Trans. zool. Soc. Lond., vol. 22, p. 223.
Leander concinnus Gurney, 1927, Trans. zool. Soc. Lond., vol. 22, p. 229.
Leander concinnus Yu, 1930a, Bull. Soc. zool. France, vol. 55, p. 555.
Leander concinnus J. Roux, 1934, Faune Colon. Franç., vol. 5, p. 545.
Leander concinnus J. Roux, 1934a, Rev. Suisse Zool., vol. 41, p. 218.
Palaemon lagdaoensis Blanco, 1939, Philipp. Journ. Sci., vol. 69, p. 167, pl. 1.

Siboga Expedition

River near Station 33, Pidjot, Lombok; March 25, 1899. — 4 specimens 18-50 mm.
Station 58, anchorage off Seba, Sawu Island; dredge and shore exploration; depth up to 27 m; bottom sand; April 25, 1899. — 1 specimen 28 mm.
Station 142, Obimajor, Moluccas; in river; August 5-7, 1899. — 16 specimens 25-32 mm.

Snellius Expedition

Rivulet near Menado, N. Celebes; depth 0-1 m; August 28, 1929. — 14 specimens 12-48 mm.

Museum Leiden

Pulu We, Northpoint of Sumatra; May, 1922, February, 1927 and July, 1930; leg. P. Buitendijk. — 21 specimens (included ovigerous females) 36-56 mm.

Atjeh (Atchin); leg. capt. Storm; ex. coll. Mus. Lübeck. — 4 specimens 27-42 mm.
Bay of Batavia, W. Java; January, 1908; leg. P. Buitendijk. — 1 ovigerous female 45 mm.
Tjipaserangan river near desa (= native village) Tjikelet, S. W. Java; June 13 and 14, 1939; leg. C. P. J. de Haas. — 2 specimens 31 and 38 mm.
Tjisanggiri river near desa Kalong, S. W. Java; June 15 and 16, 1939; leg. C. P. J. de Haas. — 10 juvenile specimens 11-14 mm.
Tjilatjap, southcoast of Java; August, 1905; leg. P. Buitendijk. — 1 specimen 25 mm.
Raka-mbaha (= Mbawa), Flores; close to the sea; 1888-1889; leg. M. Weber. — 6 specimens 37-44 mm.
Rivulet near Balangnipa, Celebes; 1888-1889; leg. M. Weber. — 2 specimens 32 and 43 mm.
Sula Sanana, Moluccas; 1877; leg. J. E. Teysmann. — 1 specimen 45 mm.
East Indian Archipelago. — 2 specimens 34 and 45 mm.
Tahiti; ex. coll. Mus. Godeffroy. — 1 specimen 50 mm.

Museum Amsterdam

Sinabang, Simalur, off W. Sumatra; January, 1913; leg. E. Jacobson. — 1 specimen 66 mm.
Gunung Sitoli, Nias; leg. J. P. Kleiweg de Zwaan. — 34 specimens (included ovigerous females) 23-50 mm.
Western Nias; leg. J. P. Kleiweg de Zwaan. — 4 specimens (1 ovigerous female) 32-57 mm.
Nias; 1910; leg. J. P. Kleiweg de Zwaan. — 10 specimens (included ovigerous females) 32-50 mm.
Raka-mbaha (= Mbawa), southcoast of Flores; close to the sea; 1888-1889; leg. M. Weber. — 22 specimens (included ovigerous females) 22-56 mm.
Konga, Larantuka Strait, E. Flores; in river; December 9, 1908 and October 30, 1909; leg. G. A. J. van der Sande. — 8 specimens 40-56 mm.
Palima, S. W. Celebes; estuary of the Tjenrana river; brackish water; 1888-1889; leg. M. Weber. — 71 specimens 11-18 mm.
Balangnipa, S. W. Celebes; in large river, which is subject to the influence of the tides, being fresh at low tide; 1888-1889; leg. M. Weber. — 2 specimens 28 and 39 mm.
Balangnipa, S. W. Celebes; in small rivulet, which has no connection with the sea; 1888-1889; leg. M. Weber. — 15 specimens 26-52 mm.
Bonea river, Salajar Island; 1888-1889; leg. M. Weber. — 3 specimens (1 ovigerous female) 49-55 mm.
Ternate; pool in the dry bed of a small river; February 1, 1903; leg. L. F. de Beaufort. — 7 specimens 41-54 mm.

Description: The rostrum (fig. 12a) is well developed, it is slender and slightly curved upwards at the tip, it reaches generally somewhat beyond the end of the scaphocerite, sometimes, however, it fails to reach the end of that scale. The upper margin is provided with 5 to 8, seldom 3 and mostly 6 teeth, which are placed in the proximal half of the upper margin, its distal half is entire except for a small subapical tooth. Only the first dorsal tooth is placed behind the posterior limit of the orbit. The first and second teeth articulate with the rostrum proper. The lower margin of the rostrum bears 3 to 7 (mostly 4 or 5) teeth, which are placed in the distal $\frac{2}{3}$ of that margin. The proximal teeth are placed more closely together than the distals. O r t m a n n mentions a specimen which had the lower margin devoid of teeth, this specimen undoubtedly is abnormal. Both upper and lower margin of the rostrum are provided with a single row of hairs. The carapace has the branchiostegal spine about as strong as the antennal. It is placed on the anterior margin of the carapace some distance below the branchiostegal groove.

The abdomen is normal in shape, the sixth segment is twice or almost twice as long as the fifth.

The telson is slightly less than 1.5 times as long as the sixth abdominal segment. The anterior pair of dorsal spines is situated in the middle of the length of the telson, the posterior pair is placed

more closely to the anterior pair than to the posterior margin of the telson. The posterior margin of the telson is provided with the usual two pairs of spines and two feathered setae, the inner pair of spines reaches with about half its length beyond the median tooth of the posterior margin.

The cornea of the eyes is about as long as the stalk, but is distinctly broader. A distinct ocellus is present.

The antennular peduncle (fig. 12b) fails to reach the end of the scaphocerite. The stylocerite is well developed and sharply pointed, it fails to reach the middle of the basal segment, its dorsal surface is provided with a distinct longitudinal carina. The anterolateral angle of the basal segment is provided with a strong spine, which reaches far beyond the middle of the second segment of the peduncle, and also overreaches the convex anterior margin of the basal segment. The second segment, when measured in dorsal line, is distinctly shorter than the third segment. Together the second and third segments are about as long as the basal segment. The upper antennular flagellum has the two rami fused for 6 to 10 joints, the free part of the shorter ramus consists of 21 to 30 joints, it is considerably (3.5 to 6 times) longer than the fused portion.

The scaphocerite (fig. 12c) is about 2.5 times as long as broad. The outer margin is slightly convex and ends in a distinct final tooth, which is overreached by the broad anterior margin of the lamella.

The oral parts are quite typical in shape. The third maxillipede reaches as far forwards as the end of the basal segment of the antennular peduncle. The last segment is about $^2/_3$ as long as the penultimate. The antepenultimate segment is somewhat shorter than the two last segments combined. The exopod reaches slightly beyond the end of the antepenultimate segment.

The first pereiopod (fig. 12d) reaches about to the end of the scaphocerite. The fingers are blunt and as long as or distinctly longer than the palm. The carpus is elongate, almost 2.5 to 3 times as long as the chela (C o u t i è r e, 1901, reports a specimen in which the carpus is 4 times as long as the chela). The merus measures about $^3/_4$ of the length of the carpus. The ischium is about half as long as the merus. The second pereiopod (fig. 12e) is slender, it reaches with half the carpus or less beyond the scaphocerite. The fingers are $^2/_3$ as long as the palm; the fixed finger bears in the proximal third a small but distinct tooth, the dactylus also bears a small tooth on the cutting edge slightly anterior of the tooth of the fixed finger, moreover two smaller teeth are placed proximally of this tooth. The palm is cylindrical and not swollen. The carpus measures about 1.5 times to twice the length of the chela, it is slightly broadened anteriorly. The merus and ischium are subequal in length, both are about as long as the chela. All the segments of the second leg are not provided with spines or tubercles. The third pereiopod (fig. 12f) reaches beyond the end of the antennular peduncle, but fails to reach the end of the scaphocerite, the fifth reaches with somewhat more than the dactylus beyond the scaphocerite. The dactylus bears some tufts of setae at the anterior margin. The propodus is almost thrice as long as the dactylus, the posterior margin bears some 5 to 6 equidistant spinules. The carpus is half as long as the propodus. The merus is about as long as, but distinctly broader than the propodus. The ischium is as long as the carpus. The fifth pereiopod (fig. 12g) is much more slender than the third. The propodus is about 4 to 5 times as long as the dactylus. The carpus is about half as long as the propodus. The merus is distinctly shorter than the propodus. The ischium is shorter than the carpus. The fourth pereiopod is about intermediate in shape between the third and fifth legs.

The endopod of the first pleopod (fig. 12h) in the male is provided at its inner margin with a

small, but distinct rudiment of an appendix interna, which lacks in the female. The first pleopod is about half as long as the carapace. The presence of the rudimental appendix interna at the first

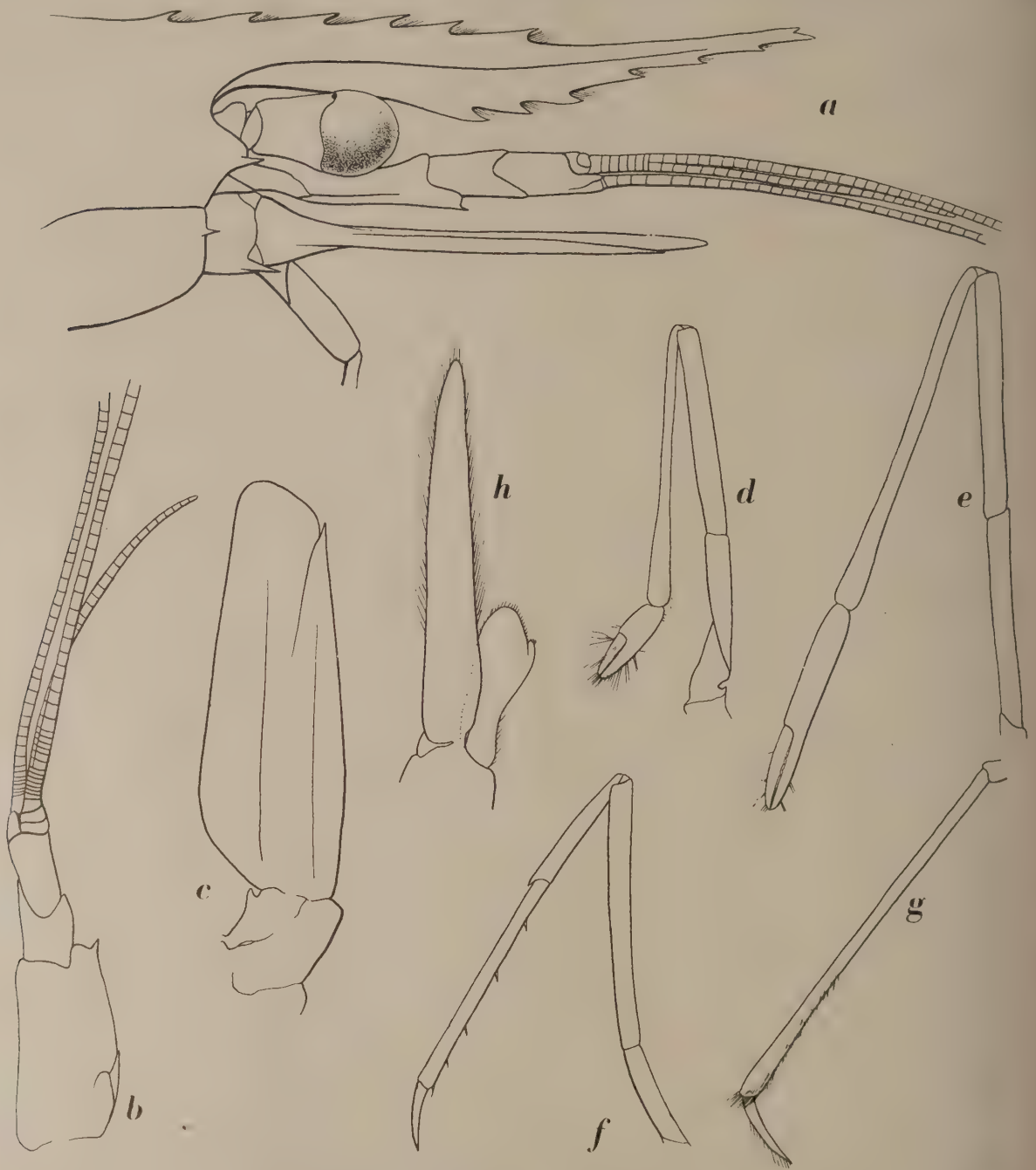

Fig. 12. *Palaemon* (*Palaemon*) *concinnus* Dana. a, anterior part of body in lateral view; b, antennula; c, scaphocerite; d, first pereiopod; e, second pereiopod; f, third pereiopod; g, dactylus and propodus of fifth pereiopod; h, first pleopod of male. a-g, × 8; h, × 15.

pleopod of the male distinguishes this species from all other members of the genus. The other pleopods are normal in shape. The appendix masculina of the second pleopod in the male is much longer and broader than the appendix interna.

The uropods are quite normal in shape.

The eggs of the ovigerous female are numerous and small, the diameter varying between 0.5 and 0.7 mm. The young specimens differ from the older by having the rostrum shorter, they mostly do not reach the tip of the scaphocerite, furthermore the unarmed portion of the rostrum is relatively shorter; the sixth abdominal segment is longer and the carpus of the first pereiopod is about twice as long as the chela.

The specimen described by Dana (1852) as *Palaemon exilimanus* in all respects resembles *Palaemon concinnus* from the same author, but for the shape of the rostrum, which in *P. exilimanus* is shorter than in *P. concinnus* and which has the distal portion not devoid of teeth. I think it very probable that the distal part of the rostrum in the type specimen of *P. exilimanus* has been broken. The fact that in *P. exilimanus* the extreme tip of the rostrum is curved strongly downwards also is an indication that the rostrum is abnormal in shape. Furthermore the only specimen of *P. exilimanus* known, was collected by the U.S. Exploring Expedition in the same locality from where it obtained the specimens of *P. concinnus,* viz. the Fiji Islands; also the fact that after Dana's description of the single specimen of *P. exilimanus* that species never has been reported again, supports the supposition of the identity of *P. concinnus* and *P. exilimanus.* The name *P. exilimanus* has page priority over *P. concinnus,* but I think it best to adopt the latter name for the present species as that name was used for the undamaged specimens and moreover is very commonly met with in literature.

Tattersall's (1921) statement, that the mandibular palp is two-jointed obviously is an error, since it is three-jointed in all my material.

Palaemon lagdaoensis described by Blanco (1939) is identical with the present species, as is shown by the description and figures given by Blanco. Blanco's statement that the second legs reach with the tip of the merus and the chela beyond the scaphocerite, is incorrect, as is shown by the figure; here not the merus but the carpus is meant.

The specimen from Atjeh (Museum Leiden) has already been recorded by De Man (1897), those of Flores, Salajar and Celebes, collected by Professor M. Weber, have been dealt with by De Man (1892).

Distribution: The species inhabits shallow waters; it lives as well in fresh, salt as in brackish waters. In literature it is recorded from: Suez (Tattersall, 1921), Port Taufiq, near Suez (Balss, 1927), Ain Musa, Gulf of Suez (Balss, 1927; Gurney, 1927), Zanzibar (Hilgendorf, 1869), Dar-es-Salaam (Ortmann, 1894), Mozambique (Hilgendorf, 1879), Aldabra (Voeltzkow, 1902; Lenz, 1905), Bemazaka, Ambongo, W. Madagascar (J. Roux, 1934), Tulear, S. W. Madagascar (J. Roux, 1934), Arm of Onilahy River, S. W. Madagascar (Coutière, 1900, 1901), Ivoloina near Tamatave and Iranjy River, Canal des Pangalanes, Tamatave province, E. Madagascar (J. Roux, 1934), Hongkong (Stimpson, 1860), Cagayan River, N. Luzon, Philippines (Blanco, 1939), Atjeh, Sumatra (De Man, 1897), near Deli, Sumatra (De Man, 1892), Buleleng, Bali (Rathbun, 1910), Ampenan, Lombok (Rathbun, 1910), Raka-mbaha, Flores (De Man, 1892), Balangnipa and Palima, S. Celebes (De Man, 1892), Salajar (De Man, 1892), Ternate, Moluccas (De Man, 1902), Amboina, Moluccas (De Man, 1888), Elat, Groot Kai, Kai Islands (J. Roux, 1919), Aru Islands (Kemp, 1925), Udjir, Aru Islands (J. Roux, 1919), Woskai River near Sungai Manumbai, Wokam, Aru Islands (J. Roux, 1919), Negerilama near Ngaiguli, Trangan, Aru Islands (J. Roux, 1919), Omboi Islands, New Britain (J. Roux, 1934a), Beilifu, Komatahu, New Ireland

(J. Roux, 1934a), Marshall Islands (Ortmann, 1890), Fiji Islands (Dana, 1852; Weitenweber, 1854), Makatea (Sendler, 1923).

Palaemon (*Palaemon*) *debilis* Dana (fig. 13)

Palaemon debilis Dana, 1852, Proc. Acad. nat. Sci. Philad., vol. 6, p. 26.
Palaemon debilis attenuatus Dana, 1852, Proc. Acad. nat. Sci. Philad., vol. 6, p. 26.
Palaemon debilis Dana, 1852a, U. S. Explor. Exped., vol. 13, p. 585.
Palaemon debilis attenuatus Dana, 1852a, U. S. Explor. Exped., vol. 13, p. 585.
Palaemon debilis Weitenweber, 1854, Lotos Praha, vol. 4, p. 61.
Palaemon debilis Dana, 1855, U. S. Explor. Exped., vol. 13, atlas, p. 12, pl. 38 fig. 6.
Palaemon debilis attenuatus Dana, 1855, U. S. Explor. Exped., vol. 13, atlas, p. 12, pl. 38 fig. 7.
Leander debilis Stimpson, 1860, Proc. Acad. nat. Sci. Philad., 1860, p. 40.
Palaemon (*Leander*) *debilis* Miers, 1879, Philos. Trans. Roy. Soc. Lond., vol. 168, p. 494.
Leander debilis p.p. Ortmann, 1890, Zool. Jb. Syst., vol. 5, p. 515.
Leander debilis Sharp, 1893, Proc. Acad. nat. Sci. Philad., 1893, p. 120.
Leander debilis Borradaile, 1901, Fauna Geogr. Mald. Laccad., vol. 1, p. 98.
Leander gardineri Borradaile, 1901, Fauna Geogr. Mald. Laccad., vol. 1, p. 98.
Leander debilis Lenz, 1901, Zool. Jb. Syst., vol. 14, p. 435.
Leander attenuatus Lenz, 1901, Zool. Jb. Syst., vol. 14, p. 435.
Leander debilis De Man, 1902, Abh. Senckenb. naturf. Ges., vol. 25, p. 808.
Palaemon debilis Rathbun, 1906, Bull. U. S. Fish Comm., vol. 23, p. 924, pl. 22 fig. 1.
Leander debilis Nobili, 1907, Mem. Accad. Sci. Torino, ser. 2 vol. 57, p. 363.
Leander debilis Borradaile, 1917, Trans. Linn. Soc. Lond. Zool., ser. 2 vol. 17, p. 404.
Palaemon debilis Maki & Tsuchiya, 1923, Rep. Dept. Agric. Formosa, vol. 3, p. 54, pl. 3 fig. 5.
Leander beauforti J. Roux, 1923, Capita Zool., vol. 2 pt. 2, p. 18, figs. 1, 2.
Leander beauforti Kemp, 1925, Rec. Indian Mus., vol. 27, p. 295.
Leander prox. *debilis* Kemp, 1925, Rec. Indian Mus., vol. 27, p. 297.
Leander gardineri Kemp, 1925, Rec. Indian Mus., vol. 27, p. 298.
Leander beauforti J. Roux, 1928a, Treubia, vol. 10, p. 215.
Palaemonetes pacificus Gurney, 1939a, Annot. Zool. Japon., vol. 18, p. 145, pls. 5, 6.
Leander gardineri Gurney, 1940, Annot. Zool. Japon., vol. 19, p. 80.
Leander longicarpus Kubo, 1941, Trans. biogeogr. Soc. Japan, vol. 3, p. 308, textfig. 3, pl. 20 fig. 1.
Leander longicarpus Kubo, 1942, Journ. Imp. Fish. Inst. Tokyo, vol. 35, p. 51, figs. 13, 19F, Q, 20F, 21F, 22F, 23F, M, 24F, Q, 25F, F', 26F, S, 27F, P, 28E, N, 29F.
Leander debilis Edmondson, 1946, Spec. Publ. Bishop Mus. Honolulu, vol. 22, p. 251, fig. 152b.

Siboga Expedition

Station 4, Anchorage off Djangkar, E. Java, 7° 42′ S, 114° 12′.6 E; shore exploration; depth 9 m; March 9, 1899. — 1 specimen 34 mm.

River near Station 19, Bay of Labuhan Tereng, westcoast of Lombok, 8° 44′.5 S, 116° 2′.5 E; March 19-21, 1899. — 2 specimens 30 & 31 mm.

Station 181 or 231; Amboina anchorage; reef exploration; September 5-11 or November 14-18, 1899. — 1 ovigerous female 44 mm.

Snellius Expedition

Beo, Talaud Islands; fresh water; June 14-21, 1930. — 6 specimens 26-36 mm.

Museum Leiden

Pulu We, off N. Sumatra; fresh water; 1906; leg. P. Buitendijk. — 3 ovigerous females 39-41 mm.

Museum Amsterdam

Durban, S. Africa; mangrove swamp; leg. M. Weber. — 1 specimen 39 mm.
Merdika river, Amboina; December 6, 1909; leg. L. F. de Beaufort. — 2 specimens 30 & 35 mm.

Description: The rostrum (figs. 13a-b) is very long and slender, strongly curved upwards in the distal part; it may reach with about half its length beyond the scaphocerite, but sometimes it even fails to reach the end of that scale. The dorsal margin of the rostrum bears in the proximal half 2 to 8, generally 5, teeth, the first of which is placed behind the orbital margin, the second slightly before the posterior limit of the orbit. The teeth are separated by large interspaces, the second and third teeth generally are placed closest together. The first three teeth are movable. The distal part of the upper margin is entire, safe for a distinct subapical tooth. The lower margin bears 3 to 10 (mostly 6) teeth, which are regularly divided over the distal $^3/_4$ of the lower margin, the proximals of these teeth are placed closer together than the distals. The upper margin of the rostrum is provided with a single row of setae, while a double row is present at the lower margin. The carapace has the branchiostegal spine smaller than the antennal and placed on the anterior margin of the carapace just below the branchiostegal groove.

The abdomen is normal in shape. The sixth segment is 1.5 times to slightly more than twice as long as the fifth. The telson is about as long as the sixth abdominal segment. It is elongate in shape and is provided with the usual two pairs of dorsal spinules, which are placed in the middle and at $^3/_4$ of the length of the telson. The posterior margin of the telson bears the usual two pairs of spines and the two feathered setae. The inner spines reach with more than half their length beyond the tip of the telson.

The eyes just fail to reach to the end of the basal segment of the antennular peduncle. The cornea is about as long as, but distinctly broader than the stalk.

The stylocerite (fig. 13c) is small and pointed, it fails to reach the middle of the basal segment of the antennular peduncle; a faint carina is present on the dorsal surface of the stylocerite. The outer margin of the basal segment is slightly convex and ends in a distinct anterolateral tooth, which reaches about to the middle of the second peduncular segment, but is distinctly overreached by the strongly convex anterior margin of the basal segment. The second segment of the peduncle is shorter than the third, together these joints measure about $^2/_3$ of the length of the basal segment. The upper antennular flagellum has the two rami fused for 7 to 14 joints, the free part of the shorter ramus consists of 7 to 17 joints, it is about as long as or slightly longer (sometimes much shorter, vid. Kemp, 1925) than the fused part.

The scaphocerite (fig. 13d) is somewhat more than thrice as long as broad, it reaches with about $^1/_3$ of its length beyond the antennular stalk. The outer margin is almost straight and ends in a strong final tooth, which is distinctly overreached by the lamella. The lamella has the inner antero-lateral angle more or less acute.

The oral parts are quite typical in shape. The epipod of the first maxillipede is divided into rounded lobes. The third maxillipede is slender, it reaches distinctly beyond the distal margin of the basal segment of the antennular peduncle. The last segment measures $^2/_3$ of the length of the penultimate segment. The antepenultimate segment is about twice as long as the ultimate.

The first pereiopods (fig. 13e) reach to, or just fail to reach to the end of the scaphocerite. The

fingers are about as long as or slightly longer than the palm. The carpus is slender, it is somewhat more than twice as long as the chela (in young specimens somewhat shorter) and is slightly broadened anteriorly. The merus is distinctly shorter than the carpus. The ischium is about half as long as the

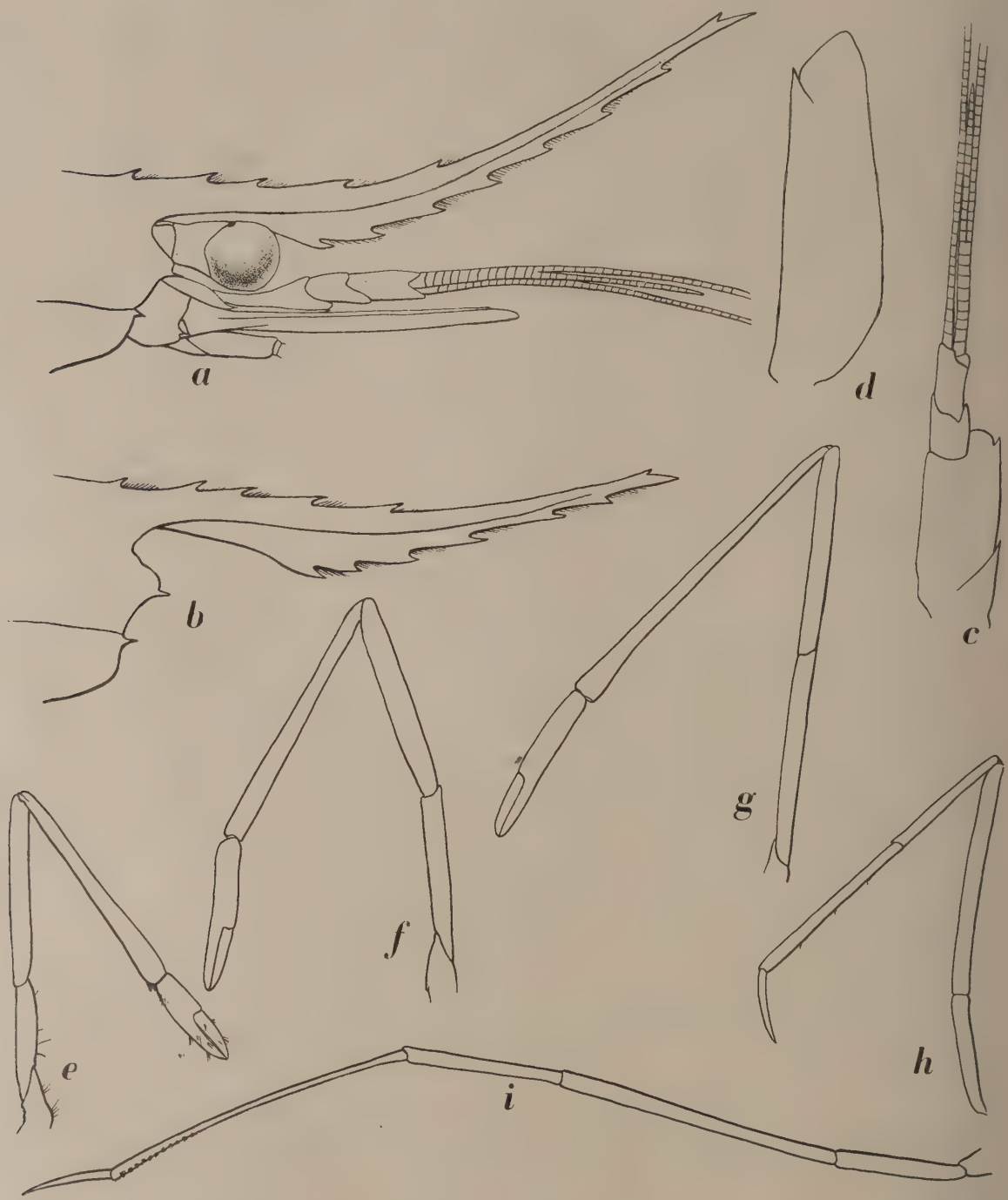

Fig. 13. *Palaemon* (*Palaemon*) *debilis* Dana. a, anterior part of body in lateral view; b, rostrum in lateral view; c, antennula; d, scaphocerite; e, first pereiopod; f, g, second pereiopods; h, third pereiopod; i, fifth pereiopod. a, b, × 10; c-i, × 14.

carpus. The second pair of pereiopods (figs. 13f, g) is extremely slender, the legs are equal. They reach with the entire chela, and sometimes also with a part of the carpus, beyond the scaphocerite. The chela is slender, the fingers are unarmed and close for their entire length, they measure about $^2/_3$ of the length of the palm. The carpus is more or slightly less than twice as long as the chela. The merus measures about $^2/_3$ of the length of the carpus. The ischium is about as long as the merus. All joints are unarmed. The last three pereiopods are slender, the third (fig. 13h) fails or almost fails to reach the end of the scaphocerite. The dactylus is about $^2/_5$ as long as the propodus. The propodus is provided at its posterior margin with some very small spinules. The carpus measures $^2/_3$ of the length of the propodus and almost half the length of the merus. The ischium is somewhat shorter than the carpus. The fifth pereiopod (fig. 13i) reaches with the dactylus or slightly more beyond the scaphocerite. The dactylus measures somewhat more than $^1/_4$ of the length of the propodus. The posterior margin of the propodus bears in the proximal part some very small scattered spinules, while in the distal part the usual transverse rows of hairs are present. The carpus is about half as long as the propodus, the merus is about as long as the propodus, while the ischium is about as long as the carpus. The relation between the length of the joints of the fourth pereiopod is intermediate between that of the third and fifth legs.

The endopod of the first pleopod of the male is ovate in shape, with the inner margin distinctly concave, no trace of an appendix interna is visible. The first pleopod is about half as long as the carapace. The appendix masculina of the second pleopod is much longer and stronger than the appendix interna.

The uropods are normal in shape.

The eggs are numerous and small, their diameter varies between 0.5 and 0.9 mm.

After examination of my material and of the literature concerning the present species, I have come to the conclusion that it it impossible to keep the forms described as *Leander beauforti, Palaemon* (or *Leander*) *debilis* and *Leander gardineri* separated. *Leander beauforti* is distinguished by Kemp (1925) on account of having the carpus of the second leg twice or slightly less than twice as long as the chela, while in *L. debilis* the carpus should be distinctly less than twice as long as the chela. In my material, even from one locality (e.g. from the Talaud Islands), the carpus of the second leg varies between 1.5 times and slightly more than twice the length of the chela, showing all transitions between these two extremes. Also the characters mentioned by Kemp (1925, p. 298) for distinguishing *L. debilis* and *L. gardineri* are too variable in my material to be of specific value. The carapace of the specimens at my disposal varies between being slightly longer than the sixth abdominal segment and being about as long as the fifth and sixth segments together. The second tooth of the rostrum sometimes is placed over the posterior margin of the orbit, but mostly is situated more or less in advance of that margin. The anterior margin of the carapace always is more or less concave. The antennal scale may be shorter, as long as, or longer than the carapace. And the second legs sometimes reach to the end of the scaphocerite, but also may reach beyond that scale with the entire chela and part of the carpus, while all transitions between these extremes occur. The variability of the relation between the length of the carpus and the chela has already been pointed out above. As all these characters are variable and seem in no way linked with one another in my material, as the differences are so small and unimportant and as I can find no other differences, the three forms in my opinion can not be kept separate. They therefore are united here to one species, which has to bear the name *Palaemon debilis* Dana.

Kubo's (1941, 1942) account of *Leander longicarpus* shows his material to be *P. debilis*.

Distribution: The species inhabits shallow coastal waters and also is found in brackish or even fresh waters. It is recorded in literature from: Ain Musa, Gulf of Suez (Kemp, 1925), Rodriguez (Miers, 1879; Kemp, 1925), Aldabra (Borradaile, 1917), Diego Garcia, Chagos Archipelago (Borradaile, 1917), Landu and Ekasdu, Miladumadulu Atoll, Maldive Archipelago (Borradaile, 1901), Manradu, Miladumadulu Atoll, Maldive Archipelago (Kemp, 1925), Dunk Island, Maldive Archipelago (Kemp, 1925), Addu Atoll, Maldive Archipelago (Kemp, 1925), Nancowry Island, Nicobar Group (Kemp, 1925), Riukiu Islands (Stimpson, 1860; Kubo, 1941, 1942), Formosa (Maki & Tsuchiya, 1923), Ternate, Moluccas (De Man, 1902), Kairatu, Ceram, Moluccas (J. Roux, 1923), Merdika River, Amboina, Moluccas (J. Roux, 1928a), Saipan, Marianne Islands (Gurney, 1939a), Hao and Rikitea, Tuamotu Islands (Nobili, 1907), Hawaiian Archipelago (Dana, 1852; Weitenweber, 1854; Stimpson, 1860; Edmondson, 1946), Oahu (Sharp, 1893; Lenz, 1901), Kaliki, Oahu (Lenz, 1901), Pearl Harbor and Honolulu Reef, Oahu (Rathbun, 1906), Southcoast of Molokai (Rathbun, 1906), Lahaina, Maui (Lenz, 1901), Mauna Loa, Kealakekua Bay and Puako Bay, Hawaii (Rathbun, 1906), Hilo, Hawaii (Dana, 1852; Rathbun, 1906), Opae, Oehau, Hawaiian Islands (Rathbun, 1906).

Palaemon (*Palaemon*) *paucidens* De Haan (fig. 14)

Palaemon paucidens De Haan, 1841, Fauna Japonica, Crust., atlas, pl. 45 fig. 11.
Palemon paucidens De Haan, 1849, Fauna Japonica, Crust., p. 170.
Leander paucidens Stimpson, 1860, Proc. Acad. nat. Sci. Philad., 1860, p. 40.
Palemon Paucidens Herklots, 1861, Tijdschr. Ent., vol. 4, p. 145.
Palemon paucidens Bouvier, 1901, Bull. Mus. Hist. nat. Paris, vol. 7, p. 332.
Leander paucidens Doflein, 1902, Abh. Bayer. Akad. Wiss., vol. 21, p. 640.
Palaemon paucidens Rathbun, 1902b, Proc. U. S. Nat. Mus., vol. 26, p. 51.
Leander paucidens Brashnikov, 1907, Mém. Acad. Sci. Petersb., ser. 8 vol. 20 pt. 6, p. 175.
Leander paucidens De Man, 1907, Trans. Linn. Soc. Lond. Zool., ser. 2 vol. 9, p. 409.
Leander paucidens Balss, 1914, Abh. Bayer. Akad. Wiss., suppl. vol. 2 pt. 10, p. 58.
Leander paucidens Kemp, 1918a, Mem. Asiat. Soc. Bengal, vol. 6, p. 270.
Leander paucidens Parisi, 1919, Atti Soc. Ital. Sci. nat., vol. 58, p. 76.
Palaemon paucidens Urita, 1921, Dobuts. Zasshi, vol. 33, p. 214-220.
Leander paucidens Annandale, 1922, Annot. Zool. Japon., vol. 10, p. 137.
Palaemon (*Leander*) *paucidens* Gee, 1925, Lingnaam agric. Rev., vol. 3, p. 158.
Leander paucidens Kemp, 1925, Rec. Indian Mus., vol. 27, p. 291.
Palaemon paucidens Sowerby, 1925, Nat. Note-Book in China, p. 133.
Palaemon (*Leander*) *paucidens* Kellogg, 1928, Lingnan Sci. Journ., vol. 5, p. 352.
Leander paucidens Derjavin, 1930, Hydrobiol. Zeitschr. biol. Wolga Sta., vol. 9, p. 2.
Leander Paucidens Yokoya, 1931, Journ. Coll. Agric. Tokyo, vol. 11, p. 106, textfigs. 10-19, pl. 10 figs. 98-107, pls. 11-15.
Leander paucidens Miyadi, 1933, Japan. Journ. Zool., vol. 5, p. 184.
Leander pausidens Uéno, 1933, Annot. Zool. Japon., vol. 14, p. 113.
Leander paucidens Birstein & Vinogradov, 1934, Zool. Journ. Moscow, vol. 13, p. 44.
Leander paucidens Derjugin & Kobjakova, 1935, Zool. Anz., vol. 112, p. 142.
Leander paucidens Kubo, 1937, Bull. Japan. Soc. sci. Fish, vol. 5, p. 346, fig. 1B.
Leander paucidens Matsui & Wainai, 1937, Japan. Journ. Limnol., vol. 7, p. 31.
Leander paucidens Miyadi, 1937, Soyokubutu oyobi Dôbutu, vol. 5, p. ...
Leander paucidens Miyadi, 1938, Int. Rev. Hydrobiol. Hydrogr., vol. 37, p. 133.
Leander paucidens Miyadi, 1938a, Japan. Journ. Limnol., vol. 8, p. ...

Leander paucidens Birstein, 1939, Zool. Journ. Moscow, vol. 18, p. 55.
Leander paucidens Mori, 1939, Annot. Zool. Japon., vol. 18, p. 75.
Leander paucidens Birstein, 1941, Life Freshw. U.S.S.R., vol. 1, p. 424.
Leander paucidens Kubo, 1942, Journ. Imp. Fish. Inst. Tokyo, vol. 35, p. 25, figs. 1, 3-6, 19A, L, 20A, 21A, 22A, 23A, H, 24A, L, 25A, A', 26A, N, 27A, R, 28A, P, 29A, L.

Museum Leiden

Japan; cotypes. — 3 specimens (2 ovigerous females) 55-60 mm.

Museum Amsterdam

Hakone Lake, Japan; 2400 feet above sealevel; July, 1896. — 1 specimen 48 mm.
Locality unknown. — 1 specimen 54 mm.

Description. The rostrum (fig. 14a) is rather high and almost straight, it reaches to or slightly (at most with $^1/_5$ of its length) beyond the end of the scaphocerite. The apex of the rostrum is curved upwards. The upper margin bears four to six teeth, the first of which is placed on the carapace behind the posterior limit of the orbit. The other teeth are regularly divided over the proximal $^2/_3$ of the upper margin of the rostrum, the distal third of that margin is entire, with the exception of a small subapical tooth, which is placed close near the apex. The lower margin of the rostrum bears 1 to 4, generally 2 or 3, teeth in the distal part, the last tooth is more remote from the apex of the rostrum than from the penultimate ventral tooth. A double row of short setae is placed along the lower margin of the rostrum, while the upper margin is provided with a single row. The carapace has the branchiostegal spine about as strong as the antennal, it is situated on the anterior margin of the carapace.

The abdomen is normal in shape The sixth segment is 1.5 times as long as the fifth. The telson measures $^5/_4$ of the length of the sixth abdominal segment. It is elongate and is provided with the usual two pairs of spines, the anterior of which is situated in the middle of the telson, the posterior pair midway between the anterior pair and the posterior margin of the telson. The final margin of the telson ends in a median sharp point, which is flanked by the usual two pairs of spines and the two plumose setae.

The eyes are normal in shape, they distinctly fail to reach the end of the basal segment of the antennular peduncle. The cornea is shorter and broader than the stalk. An ocellus is present.

The stylocerite (fig. 14b) is slender and pointed, it almost reaches the middle of the basal segment. The outer margin of the basal segment of the antennular peduncle is straight and ends in a strong anteroventral tooth, which reaches beyond the middle of the second segment. The anterior margin of the basal segment is convex, but is distinctly overreached by the anterolateral spine. The second and third segments of the peduncle, when measured in dorsal line are of the same length, together they are somewhat shorter than the basal segment. The upper antennular flagellum has the two rami fused for 8 or 9 joints; the free portion of the shorter ramus consists of 20 to 28 joints, being thereby 2.5 to 3.5 times as long as the fused portion.

The scaphocerite (fig. 14c) reaches with about $^1/_5$ of its length beyond the antennular peduncle. It is of about the same breadth over its entire length. The outer margin is slightly convex and ends in a strong final tooth, which is distinctly overreached by the convex anterior margin of the lamella.

The oral parts are typical in shape. The third maxillipede is slender, it reaches to or a trifle

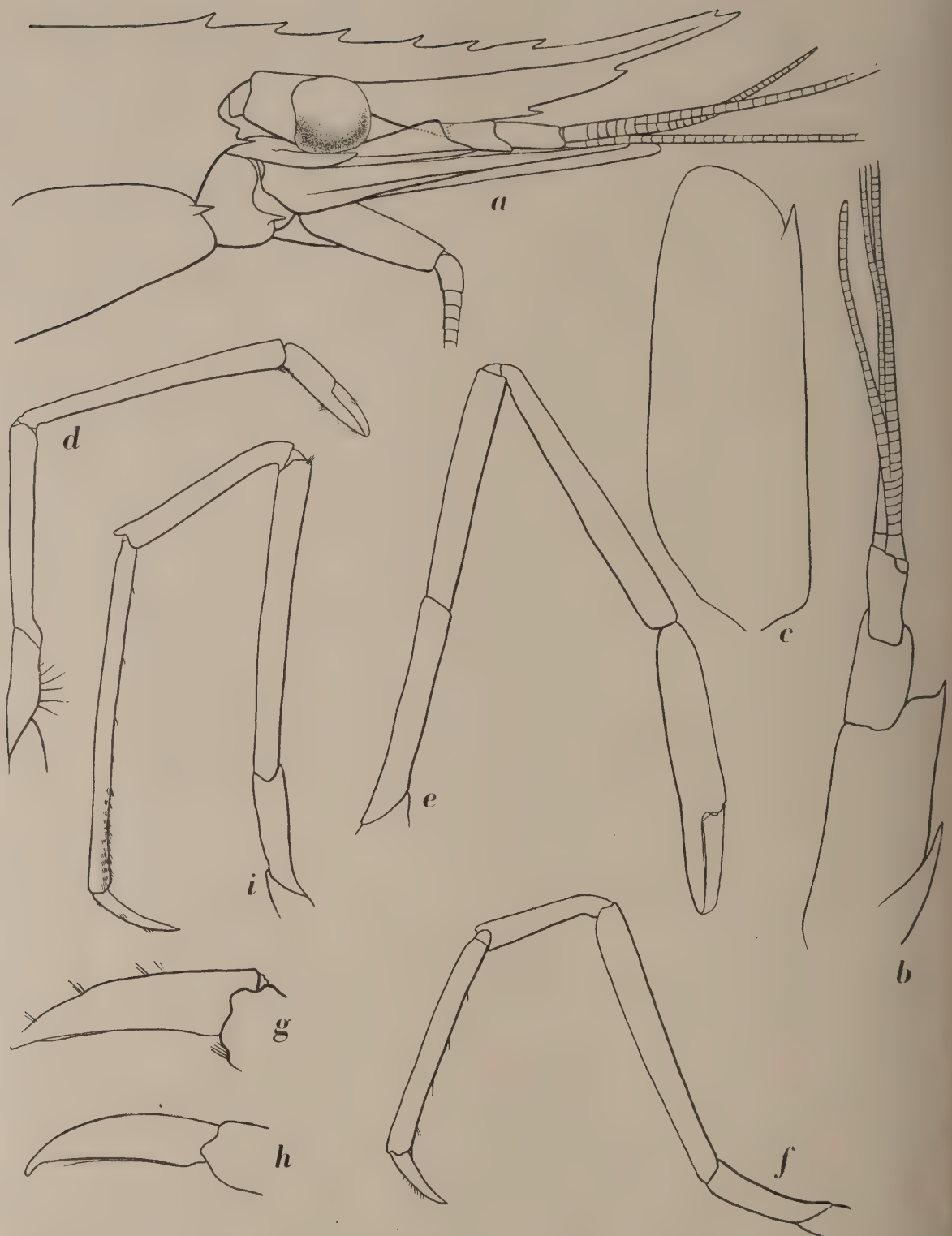

Fig. 14. *Palaemon* (*Palaemon*) *paucidens* De Haan. a, anterior part of body in lateral view; b, antennula; c, scaphocerite; d, first leg; e, second leg; f, third leg; g, dactylus of third leg (type); h, dactylus of third leg (specimen from Hakone Lake); i, fifth leg. a-f, i, × 8; g, h, × 30.

beyond the end of the antennal stalk. The last segment is slightly longer than $^2/_3$ of the length of the penultimate segment. The antepenultimate joint is slightly less than 1.5 times as long as the penultimate.

The first pereiopod (fig. 14d) reaches with its tip about to the end of the scaphocerite. The fingers are slender and are as long as the palm. The carpus is about twice as long as the chela, it broadens slightly anteriorly. The merus is about $^3/_4$ as long as the carpus. The ischium is short, being about half as long as the merus. The second pereiopods (fig. 14e) are stronger than the first, they reach with the entire chela beyond the scaphocerite. The fingers are slender, they measure $^1/_2$ to $^2/_3$ of the length of the palm. The cutting edge of the dactylus bears in its proximal part a small tooth, no teeth are observed on the rest of the cutting edge and also none are present on the cutting edge of the fixed finger. The palm is elongate and cylindrical. The carpus is as long as or slightly longer than the chela, it slightly broadens anteriorly. The merus is about $^4/_5$ as long as the carpus. The ischium is somewhat shorter than the merus. The last three pereiopods are rather slender. The third (fig. 14f) just fails to reach to the end of the scaphocerite. The dactylus is falciform and simple; in my male specimen from Hakone Lake (Museum Amsterdam), however, the posterior margin of the dactylus ends in an extremely thin transparent lamella, and shows a distinct accessory tooth behind the apex (fig. 14h), in the specimens from the Leiden Museum this toothlike process of the lamella is very inconspicuous or absent (fig. 14g). The propodus is slightly more than 2.5 times as long as the dactylus, its posterior margin is provided with some spines. The carpus measures about $^2/_3$ of the length of the propodus. The merus is somewhat longer and stronger than the propodus. The ischium is about half as long as the propodus. The fifth pereiopod (fig. 14i) is much more slender, it reaches with the dactylus and a part of the propodus beyond the scaphocerite. The dactylus is slender. The propodus is about 3.5 times as long as the dactylus, its posterior margin bears, except the scattered spinules, the usual transverse rows of setae in the distal part. The carpus is half as long as the propodus. The merus is slightly shorter than the propodus. The ischium is about half as long as the propodus. The fourth leg is intermediate in shape between the third and the fifth legs.

The endopod of the first pleopod in the male is ovate in shape, the inner margin is concave, there is no trace of an appendix interna. In the second pleopod of the male the appendix masculina is much longer and stronger than the appendix interna. The other pleopods are normal in shape.

The uropods are typical in shape.

Doflein (1902) remarks that the branchiostegal spine is removed from the anterior margin in the present species; this, however, is not correct, as this spine, though it is placed distinctly behind the antennal spine, stands on the anterior margin of the carapace, which curves strongly backwards there.

The specimen from Hakone Lake formed part of De Man's (1907) material.

Distribution: The species is known from fresh, brackish and salt water, it is found in fresh-water lakes up to an altitude of almost 4400 feet. It lives on the bottom and is known from depths up to 170 m. *Palaemon paucidens* is recorded in literature from: Mouth of the Suifun River near Vladivostoc (Birstein & Vinogradov, 1934), Gensan and Fusan, Korea (Rathbun, 1902b), Suigen, Urutin and Kôshyû, Korea (Kubo, 1942), Shanghai (Gee, 1925; Sowerby, 1925; Kellogg, 1928), Foochow (Balss, 1914; Kellog, 1928), Japanese Sea (Derjugin & Kobjakova, 1934), between Yesso and the Asiatic mainland, 43° 5′ N, 139° 24′ E (Balss, 1914), Tym

River, Sakhalin (Derjavin, 1930), Tukaichi Lake, S. Sakhalin (Brashnikov, 1907), Tibesan Lake, S. Sakhalin (Kubo, 1942), Yeturup, Kuriles (Doflein, 1902; Balss, 1914; Miyadi, 1933, 1938; Uéno, 1933), Kunasiri, Kuriles (Miyadi, 1938), Japan (De Haan, 1841, 1849; Herklots, 1861; Bouvier, 1901; Parisi, 1919), Abasiri and Mokoto Lakes, Yesso (Kubo, 1942), Nemuro (Doflein, 1902), Sapporo (Kemp, 1918a; Kubo, 1942), Titose and Hakodate, Yesso (Kubo, 1942), Aomori, Hondo (Rathbun, 1902b), Ohata, Nobedi and Aisaka (Kubo, 1942), Lake Towada (Matsui & Wainai, 1937; Kubo, 1942), Mogami River, Yamagata and Murakami (Kubo, 1942), Washinokami, Onagawa Bay near Sendai (Balss, 1914), Matsushima near Sendai (Rathbun, 1902b), Lake Chuzenzi near Nikko (Balss, 1914), Kasumiga-ura (Kemp, 1918a; Kubo, 1942), Kizaki, Suwa and Yamanaka Lakes, Satte, Teganuma, Yamaguti and Komaba (Kubo, 1942), Tokyo (Yokoya, 1931), Misaki (Rathbun, 1902b), Hakone Lake (De Man, 1907; Balss, 1914; Kubo, 1942), Shimoda (Stimpson, 1860), Yosida, Gihu, Kawagoye, and Lake Hamana (Kubo, 1942), Lake Biwa (Rathbun, 1902b; Kemp, 1918a; Annandale, 1922; Mori, 1939; Kubo, 1942), Ogura Pond near Kyoto, and Yodo River near Osaka (Kemp, 1918a), Fukuyama, Hondo (Kubo, 1942), Oki Islands (Kubo, 1942), Tokusima, Shikoku (Kubo, 1942), Nagasaki, Kyushyu (Rathbun, 1902b; Kubo, 1942), Fukuoka, Kumamoto and Itiki (Kubo, 1942), Kawatana and Kurume (Rathbun, 1902b), Bay of Kagoshima, Kyushyu (Urita, 1921), Okinawa, Riukiu Islands (Miyadi, 1937).

Palaemon (*Palaemon*) *capensis* (De Man) (fig. 15)

Leander capensis De Man, 1897, in Weber, Zool. Jb. Syst., vol. 10, p. 174, pl. 15 fig. 3.
Leander capensis Stebbing, 1910, Ann. S. Afr. Mus., vol. 6, p. 386.
Leander serrifer Stebbing, 1914, Ann. S. Afr. Mus., vol. 15, p. 31.
Leander capensis Kemp, 1925, Rec. Indian Mus., vol. 27, p. 291.
Leander capensis Barnard, 1947, Ann. Mag. nat. Hist., ser. 11 vol. 13, p. 391.

Museum Amsterdam

Knysna river, Westfort, S. Africa; fresh water; 1894; leg. M. Weber; cotypes. — 5 specimens 39-52 mm.

The present specimens have been extensively described by De Man. The following additions may be added to this description:

Like in all other species of *Palaemon,* here too the branchiostegal groove is distinct and sharp, it reaches the anterior margin of the carapace just above the branchiostegal spine, which is placed some distance behind that margin.

The pleurae of the fourth and fifth abdominal segments have the tips rounded, there is no trace of the final tooth, which may be found in almost any other species of the present subgenus.

The antennula (fig. 15a) has the stylocerite slender, it reaches about to the middle of the basal segment of the antennular peduncle. The anterolateral spine of the basal segment reaches somewhat beyond the middle of the second segment. The anterior margin of the basal segment is rounded, but fails to overreach the anterolateral spine. The upper antennular flagellum has the two rami fused for 6 joints, the first of which is rather large, the following very short, the fifth and sixth are fused

in the outer half. The free part of the shorter ramus consists of 23 to 31 joints, it is six times as long as the fused portion. The scaphocerite is of the normal shape.

The oral parts are quite normal in shape (fig. 15b, c).

The first pleopod of the male has the endopod ovate with the inner margin concave; no appendix interna is present. The appendix masculina of the second pleopod of the male is much longer and more robust than the appendix interna.

According to Barnard (1947) the specimen recorded by Stebbing (1914) under the name *Leander serrifer* is nothing but a *Palaemon capensis*.

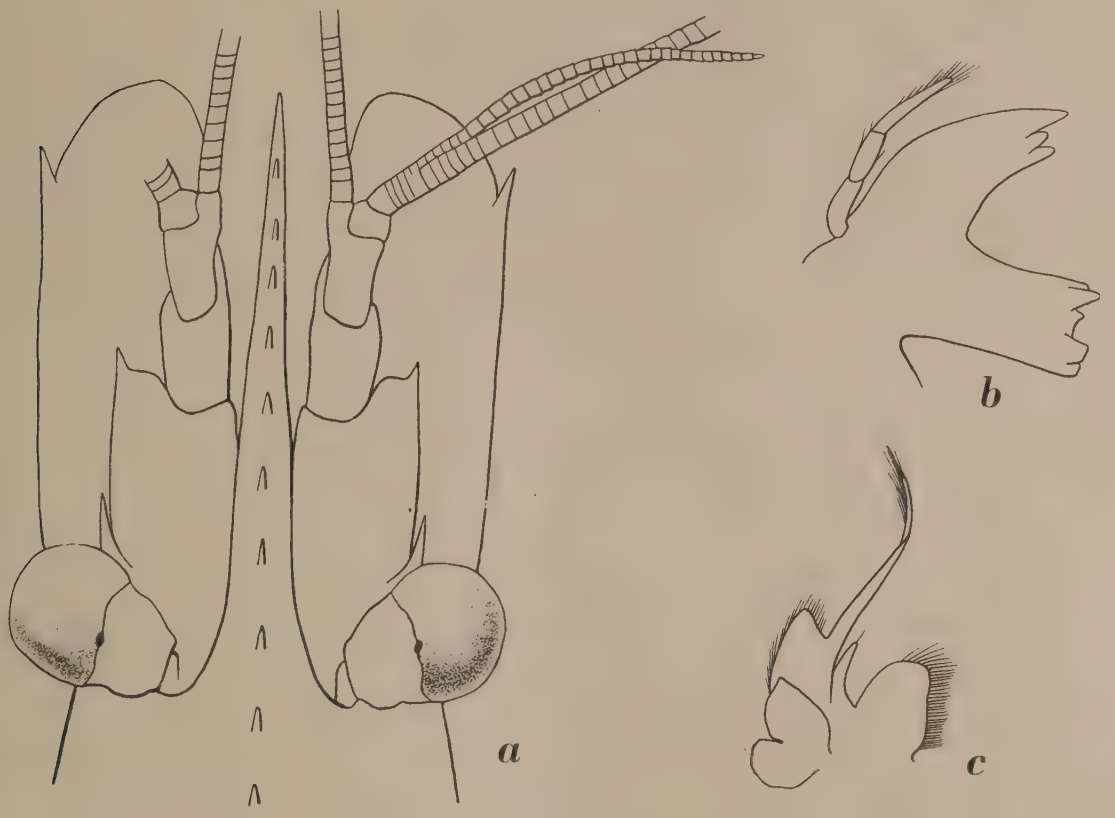

Fig. 15. *Palaemon* (*Palaemon*) *capensis* (De Man). a, anterior part of body in dorsal view; b, mandible; c, first maxillipede. a, × 10; b, × 33; c, × 14.

The species is rather aberrant by having the apex of the pleurae of the last two abdominal segments rounded, also the upper flagellum of the antennula has the fused part of a somewhat other shape than the rest of the species of the present genus.

Distribution: The species is known from several rivers in Cape Province, South Africa: Palmiet River near Kleinmond, River Zonder End and Buffeljacht River (the latter two are tributaries of Breede River), and Duivenhoks River at Heidelberg (Barnard, 1947), Knysna River (De Man, 1897; Barnard, 1947), Gamtoos River (Barnard, 1947), Baakens River near Port Elizabeth (Stebbing, 1914; Barnard, 1947).

Palaemon (*Palaemon*) *affinis* H. Milne Edwards (fig. 16)

Palemon affinis H. Milne Edwards, 1837, Hist. nat. Crust., vol. 2, p. 391.
Palemon Quoianus H. Milne Edwards, 1837, Hist. nat. Crust., vol. 2, p. 393.
non *Palaemon Quoianus* Krauss, 1843, Südafr. Crust., p. 55.
Palaemon Quoianus White & Doubleday, 1843, Dieffenbach's Voy. New Zealand, vol. 2, p. 268.
Palaemon Quoianus White, 1847, List Crust. Brit. Mus., p. 78.
Palaemon affinis White, 1847, List Crust. Brit. Mus., p. 78.
Palaemon affinis Dana, 1852a, U. S. Explor. Exped., vol. 13, p. 584.
Palaemon affinis Dana, 1855, U. S. Explor. Exped., vol. 13 atlas, p. 12, pl. 38 fig. 5.
Leander serenus Heller, 1862a, Verh. zool.-bot. Ges. Wien, vol. 12, p. 527.
Leander serenus Heller, 1865, Reise Novara, Zool., vol. 2 pt. 3, p. 110, pl. 10 fig. 5.
Leander serenus Hess, 1865, Arch. Naturgesch., vol. 31 pt 1, p. 167.
Leander affinis p.p. Miers, 1876, Catal. Crust. New Zeal., p. 85.
Leander serenus Haswell, 1882, Catal. Aust. Crust., p. 195.
Leander affinis Filhol, 1885, Bibl. Éc. haute Étud., vol. 30 pt. 2, p. 52.
Leander Quoyanus Filhol, 1885, Bibl. Éc. haute Étud., vol. 30 pt. 2, p. 52.
Leander affinis Filhol, 1886, Miss. Ile Campbell, Zool., vol. 3 pt. 2, p. 433.
Leander Quoyanus Filhol, 1886, Miss. Ile Campbell, Zool., vol. 3 pt. 2, p. 434.
Palaemon affinis Bate, 1888, Rep. Voy. Challenger, Zool., vol. 24, p. 782, pl. 128 fig. 5.
non *Palaemon affinis* Heilprin, 1888, Proc. Acad. nat. Sci. Philad., 1888, p. 322.
non *Palaemon affinis* Heilprin, 1889, Bermuda Isl., p. 151.
Leander serenus Whitelegge, 1890, Journ. Roy. Soc. New S. Wales, vol. 23, p. 224.
Palaemon affinis Whitelegge, 1890, Journ. Roy. Soc. New S. Wales, vol. 23, p. 224.
Leander affinis Pfeffer, 1892, Neumayer's Deutsch. Exped. Ergebn., vol. 2, p. 547.
non *Leander affinis* Ortmann, 1893, Ergebn. Plankton Exped., vol. 2Gb, p. 47.
? *Palaemon affinis* Whitelegge, 1898, Proc. Linn. Soc. New S. Wales, vol. 23, p. 368.
non *Leander affinis* Rankin, 1900, Ann. New York Acad. Sci., vol. 12, p. 539.
Leander affinis Lenz, 1901, Zool. Jb. Syst., vol. 14, p. 435.
Leander affinis Thompson, 1901, Catal. Crust. Mus. Dundee, p. 19.
non *Palaemon affinis* Rathbun, 1902, Bull. U. S. Fish Comm., vol. 20 pt. 2, p. 125.
Palaemon affinis Thomson, 1903, Trans. Linn. Soc. Lond. Zool., ser. 2 vol. 8, p. 450.
Palaemon affinis Chilton, 1906, Trans. Proc. New Zeal. Inst., vol. 38, p. 270.
Palaemon affinis Chilton, 1909, Subantarct. Isl. New Zeal., p. 614.
Leander serenus McCulloch, 1909, Rec. Aust. Mus., vol. 7, p. 306, pl. 89 figs. 9-12.
non *Palaemon quoianus* Stebbing, 1910, Ann. S. Afr. Mus., vol. 6, p. 384.
Leander affinis Chilton, 1911, Rec. Canterbury Mus., vol. 1 pt. 3, p. 305.
Palaemon affinis Thomson, 1913, Trans. Proc. New Zeal. Inst., vol. 45, p. 240.
Leander affinis p.p. Lenz & Strunck, 1914, Deutsche Südpolar Exped., vol. 15, p. 322.
non *Leander affinis* Stebbing, 1914a, Trans. Roy. Soc. Edinb., vol. 50 pt. 2, p. 287.
non *Leander affinis* Verrill, 1922, Trans. Connect. Acad. Arts Sci., vol. 26, p. 142, pl. 48 fig. 4.
Leander affinis Verrill, 1922, Trans. Connect. Acad. Arts Sci., vol. 26, pl. 43 fig. 3, pl. 47 fig. 7.
Leander serenus Hale, 1924, Trans. Proc. Roy. Soc. S. Aust., vol. 48, p. 68.
non *Palaemon affinis* Schmitt, 1924a, Bijdr. Dierk., vol. 23, p. 72.
Leander affinis Kemp, 1925, Rec. Indian Mus., vol. 27, p. 292.
Leander serenus Kemp, 1925, Rec. Indian Mus., vol. 27, p. 292.
Leander serenus McNeill, 1926a, Aust. Encycl., vol. 2, p. 325.
non *Leander affinis* Boone, 1927, Bull. Bingham oceanogr. Coll., vol. 1 pt. 2, p. 113.
Leander serenus Hale, 1927, Crust. S. Aust., vol. 1, p. 59, fig. 54.
Leander serenus Hale, 1927a, Trans. Proc. Roy. Soc. S. Aust., vol. 51, p. 309.
Palaemon affinis Young, 1929, Trans. Proc. New Zeal. Inst., vol. 60, pp. 154, 166 (on p. 166 as *Leander affinis*).

non *Palaemon affinis* Schmitt, 1935, Sci. Surv. Porto Rico Virgin Isl., vol. 15, p. 160.
non *Leander affinis* Gurney, 1936, Proc. zool. Soc. Lond., 1936, p. 619.
Leander serenus Tubb, 1937, Proc. Roy. Soc. Victoria, vol. 49, p. 408.
Leander serenus Anderson, 1938, Proc. Roy. Soc. Victoria, vol. 50, p. 351.
Leander affinis Powell, 1947, Native Anim. New Zeal., p. 35, fig. 172.

Museum Leiden

Summer, South Island, New Zealand; 1894; leg. H. Suter. — 2 specimens 48 and 54 mm.

Description: The rostrum (fig. 16a) is robust, straight, it reaches to the end of the scaphocerite. The upper margin possesses 8 to 10 teeth, the first two or three are placed on the carapace behind the posterior limit of the orbit. The first five teeth are more or less movable. The teeth are placed regularly over the upper margin, though the distance between the last and the penultimate tooth is distinctly larger than that between the penultimate and the antepenultimate. The last tooth (sometimes the two last teeth) is placed close to the tip, giving it thereby a bifid appearance. The lower margin possesses four equally spaced teeth. Both upper and lower margin are provided with a single row of setae. The lateral carina of the rostrum continues in the posterior orbital margin. The branchiostegal spine of the carapace is almost as strong as the antennal spine, it is placed on the anterior margin of the carapace.

The abdomen is normal in shape. The pleurae of the first four segments have the tips rounded, while in the fifth it ends in a distinct small tooth. The sixth segment is about 1.5 times as long as fifth. The telson is somewhat longer than the sixth abdominal segment and is provided dorsally with the usual two pairs of spines, which are placed respectively in the middle and at three quarters of the length of the telson. The posterior margin of the telson ends in a sharp median tooth, which is flanked at each side with two spines and a feathered seta; the inner spines are longest, they are about four times as long as the outer.

The eyes are normal in shape. The cornea is shorter and broader than the stalk. An ocellus is present.

The stylocerite (fig. 16b) is long and slender, it fully reaches the middle of the basal segment of the antennular peduncle. The outer margin of the basal segment is about straight and ends in a strong anterolateral tooth, which reaches beyond the middle of the second segment. The anterior margin of the basal segment is convex and is produced forwards, it fails, however, to reach the tip of the anterolateral tooth. The second segment of the peduncle is about as long as, but distinctly broader than the third segment; together these two segments are almost as long as the basal segment. The upper antennular flagellum has the two rami fused for about 12 joints, the free part of the shorter ramus consists of about 17 joints, the free part being less than twice as long as the fused.

The scaphocerite (fig. 16c) reaches with $^1/_4$ of its length beyond the antennular peduncle and is about as long as the rostrum. The outer margin is straight and ends in a forwards directed final tooth, which falls short of the end of the lamella. The scaphocerite is about thrice as long as broad. The inner anterior angle of the lamella is rather sharp.

The oral parts are quite typical. The third maxillipede reaches to the end of the second segment of the antennular peduncle. The last joint of this maxillipede is $^2/_3$ as long as the penultimate, while the antepenultimate is about 1.5 times as long as the penultimate.

The first pereiopods (fig. 16d) reach as far forwards as, or slightly overreach the scaphocerite. The fingers are slender, they are about as long as the palm. The carpus is elongate, it is twice as long as

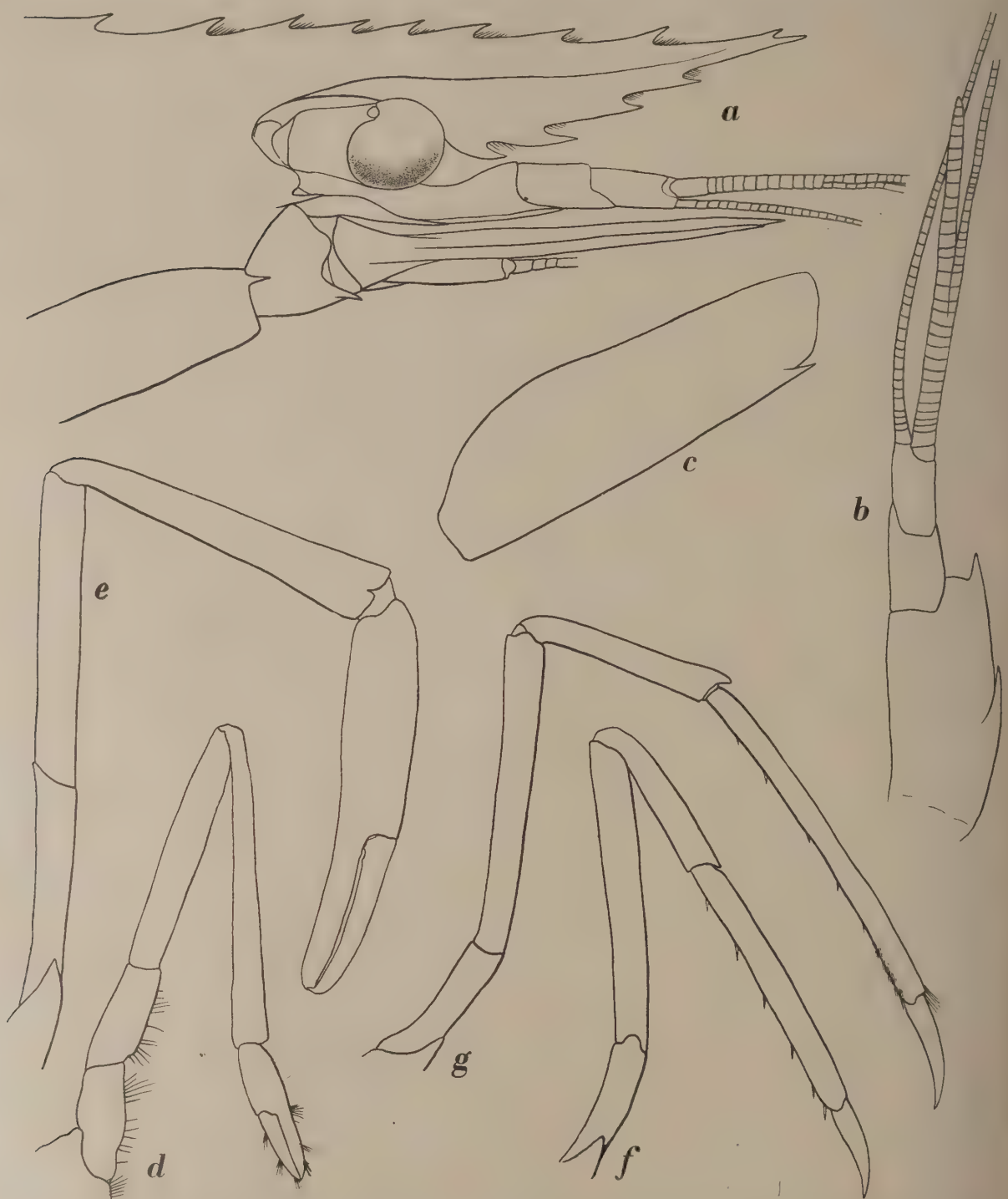

Fig. 16. *Palaemon* (*Palaemon*) *affinis* H. Milne Edw. a, anterior part of body in lateral view; b, antennula; c, scaphocerite; d, first pereiopod; e, second pereiopod; f, third pereiopod; g, fifth pereiopod. a-g, × 8.

the chela and narrows posteriorly. The merus is distinctly shorter than the carpus. The ischium is somewhat less than half as long as the merus. The second pereiopods (fig. 16e) reach with the chela beyond the scaphocerite. The fingers are slender, they measure $^2/_3$ of the length of the palm. The dactylus bears two small teeth in the proximal part of the cutting edge, the fixed finger bears one tooth there. The palm is cylindrical. The length of the carpus is about $^4/_5$ of that of the chela, it narrows posteriorly. The merus is slightly shorter than the carpus. The ischium measures about $^2/_3$ of the length of the merus. The last three pereiopods are almost similarly built. The third leg (fig. 16f) reaches about to the end of the final tooth of the scaphocerite. The dactylus is rather strong. The propodus is 2.5 times as long as the dactylus and has the posterior margin provided with some five movable spines. The carpus is somewhat more than half as long as the propodus. The merus is slightly longer and broader than the propodus. The fifth pereiopod (fig. 16g) reaches to or somewhat beyond the end of the final tooth of the scaphocerite. The propodus is thrice as long as the dactylus, its posterior margin bears some scattered small spinules, while in the distal part of that margin the usual transverse rows of closely packed setae are present. The carpus is half as long as, and the merus is as long as the propodus. The fourth pereiopod is intermediate in shape between the third and the fifth.

The pleopods are normal in shape. The endopod of the first pleopod of the male is oval in shape, the inner margin is concave; no appendix interna is present. The appendix masculina of the second pleopod of the male is slightly longer and broader than the appendix interna.

The uropods are rather broad, they are normal in shape.

Palaemon quoyanus agrees in all respects with *Palaemon affinis* but for the fact that the tip of the rostrum is simple, and that there are only six dorsal teeth on the rostrum. This, however, may be an abnormality, as is already supposed by other authors. No other species of *Palaemon* is known from New Zealand, while *P. affinis* is very common there.

The specimens recorded in literature as *Palaemon* (or *Leander*) *affinis* from Bermuda and the West Indies do not belong here, but are specimens of *Palaemon* (*Palaeander*) *northropi* (Rankin).

Palaemon affinis often has been reported from Cape of Good Hope, but, as Barnard (1947) pointed out, these specimens belong to *Palaemon pacificus*.

No constant differences seem to exist between the specimens of *Palaemon affinis* from New Zealand and *P. serenus* from Australia. Therefore these two species are synonymized here.

Distribution: *Palaemon affinis* is a litoral form. It is recorded in literature from: Falkland Islands (Miers, 1876), Rat Island, Port Curtiss, S. Queensland (McCulloch, 1909), Sydney, New S. Wales (Heller, 1862a, 1865; Hess, 1865; Haswell, 1882; Whitelegge, 1890; McCulloch, 1909), Port Jackson, New S. Wales (Bate, 1888; Whitelegge, 1890), Port Phillip, Victoria (McCulloch, 1909), Lady Julia Percy Island, Victoria (Tubb, 1937), Bay of Shoals and Vivonne Bay, Kangaroo Island, S. Australia (Hale, 1927a), Port Willunga, S. Australia (Hale, 1927b), Reevesby Island, Sir Joseph Banks Group, S. Australia (Anderson, 1938), Flinders and Pearson Islands, South Australia (Hale, 1924), Tasmania (Thomson, 1903), New Zealand (H. Milne Edwards, 1837; White, 1843, 1847; Dana, 1852; Miers, 1876; Filhol, 1885, 1886; Pfeffer, 1892; Lenz & Strunck, 1914), Bay of Islands, North Island, New Zealand (White, 1847; Thomson, 1903), Wellington, North Island (Thomson, 1903), d'Urville Island, New Zealand (Lenz, 1901), French Pass, South Island (Lenz, 1901), Christ-

church, South Island (Thomson, 1903), Lyttelton (Thompson, 1901; Thomson, 1903), Akaroa (Thomson, 1903), Otago (Thomson, 1903, 1913), Dunedin, South Island, New Zealand (Thomson, 1903), Stewart Island, New Zealand (Filhol, 1886; Thomson, 1903), Chatham Islands (Lenz, 1901; Thomson, 1903; Chilton, 1906, 1911; Young, 1929), Campbell Island (Filhol, 1886; Pfeffer, 1892). Whitelegge's (1898) record of this species from Fife Bay, S. E. Papua probably is incorrect, as the locality falls far out of the range of distribution of the species; Whitelegge's statement that one of his specimens has the lower margin of the rostrum provided with seven ventral teeth supports the above supposition; Whitelegge's specimens perhaps belong to *Palaemon concinnus* or *debilis*.

Palaemon (*Palaemon*) *ortmanni* Rathbun (fig. 17)

Leander longirostris De Man, 1881, Notes Leyden Mus., vol. 3, p. 141. (non H. Milne Edwards, 1837).
Leander longipes Ortmann, 1890, Zool. Jb. Syst., vol. 5, p. 519, pl. 37 fig. 13. (non *Palaemon longipes* Olivier, 1811).
Palaemon ortmanni Rathbun, 1902b, Proc. U. S. Nat. Mus., vol. 26, p. 53 footnote.
Leander longipes De Man, 1907, Trans. Linn. Soc. Lond. Zool., ser. 2 vol. 9, p. 409, pl. 32 figs. 26-30.
Leander longipes Kemp, 1925, Rec. Indian Mus., vol. 27, pp. 291, 293.
Leander longipes Kubo, 1937, Bull. Japan. Soc. sci. Fish., vol. 5, p. 346, figs. 2M, 2N, 3T, 3U.
Leander longipes Kubo, 1942, Journ. Imp. Fish. Inst. Tokyo, vol. 35, p. 52, figs. 13, 19G, R, 20G, 21G, 22G, 23G, R, 24G, R, 25G, G', 26G, T, 27G, Q, 28F, O, 29G, 32.

Museum Leiden

Amoy; leg. G. Schlegel. — 2 specimens 70 and 72 mm.

De Man (1907) has given an extensive description of the present species, to which I only will add the following remarks. In both specimens at my disposal, which have already been treated by De Man (1881), the first two teeth of the upper margin of the rostrum are situated on the carapace behind the orbit (fig. 17a); the first of these teeth generally is more distant from the second than the second is from the third, the following six teeth are equally spaced, while in the specimen with 8 basal and two apical teeth the eighth tooth is somewhat more remote from the seventh than the sixth is. In the specimen with three apical teeth the first of these is placed farther from the second than the third is, in both specimens the last two apical teeth and the apex of the rostrum are separated by equal interspaces. The branchiostegal spine is placed on the anterior margin of the carapace; De Man's remark, that it is slightly remote from that margin, probably is due to the fact that the anterior margin is curved backwards at the level of the branchiostegal spine.

The pleurae of the first four abdominal segments are rounded, that of the fifth ends in a minute sharp point. The sixth segment is 1.5 times as long as the fifth. The shape of the telson does not differ essentially from that of the previous species.

The antennular peduncle (fig. 17b) has the stylocerite short and slender, it fails to reach the middle of the basal segment of the peduncle. The anterolateral tooth of the basal segment is strong, but fails to reach the middle of the second segment. The anterior margin of the basal segment is strongly convex and slightly overreaches the anterolateral tooth. The third segment is distinctly longer than the

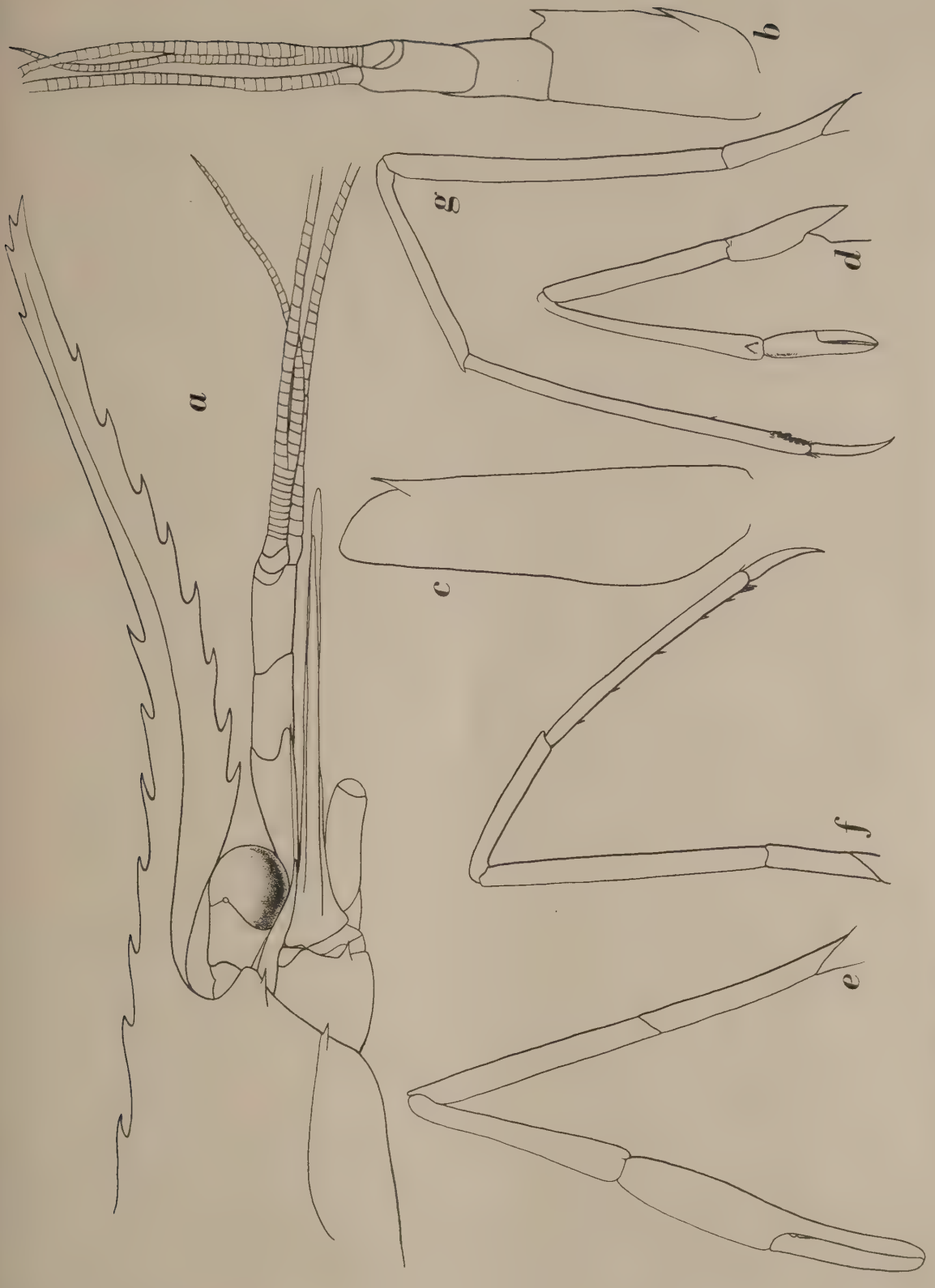

Fig. 17. *Palaemon* (*Palaemon*) *ortmanni* Rathbun. a, anterior part of body in lateral view; b, antennula; c, scaphocerite; d, first pereiopod; e, second pereiopod; f, third pereiopod; g, fifth pereiopod. a-g, ×7.

second, together these two segments are about as long as the first segment. Of the upper antennular flagellum the two rami are fused for 10 or 11 joints, while 36 or 37 joints of the shorter ramus are free, the free part being slightly more than thrice as long as the fused part.

The scaphocerite (fig. 17c) reaches slightly (with about only $^1/_7$ of its length) beyond the antennular peduncle. It is somewhat more than thrice as long as broad. The outer margin is straight, the lamella distinctly overreaches the final tooth.

The oral parts are typically built. Of the third maxillipede the last joint measures $^2/_3$ of the length of the penultimate joint, while the antepenultimate joint is about twice as long as the ultimate.

The merus of the first pereiopod (fig. 17d) is somewhat shorter than the carpus. In one of my specimens the second pereiopods (fig. 17e) are equally built, in the other the left leg is missing; in both specimens the second legs reach to the end of the rostrum. The palm of the second leg is about as long as or slightly longer than the fingers, as is also figured by De Man (1907), who in his description, however, states the fingers to be longer.

The endopod of the first pleopod of the male is ovate in shape, with the inner margin concave, no appendix interna is present. The second pleopod of the male has the appendix masculina longer and broader than the appendix interna, also the other pleopods are normal in shape.

The uropods are of the normal shape, they are rather broad and are longer than the telson. The outer margin of the exopod is slightly convex and ends in a tooth, which at its inner side is provided with a movable spine.

Distribution: This rather rare species is recorded in literature from: Kominato, Hondo, Japan (Kubo, 1942), Sagami Bay, Japan (Ortmann, 1890), Inland Sea of Japan (De Man, 1907), Tsushima Island, Japan (Rathbun, 1902b), Amoy, China (De Man, 1881).

Palaemon (Palaemon) gravieri (Yu)

Leander Gravieri Yu, 1930a, Bull. Soc. zool. France, vol. 55, p. 561, fig. 3.
Leander macrodactylus Yoshida, 1941, Bull. Fish. Exper. Sta. Tyôsen, n. 7, p. 26, pl. 6 fig. 4 (non *Palaemon macrodactylus* Rathbun).
Leander gravieri Kubo, 1942, Journ. Imp. Fish. Inst. Tokyo, vol. 35, p. 48, figs. 19E, P, 20E, 21E, 22E, 23E, L, 24E, P, 25E, E', 26E, R, 27E, O, 28D, M, 29E, 30.

The species in all respects shows the closest resemblance to *Palaemon ortmanni,* but for the dentition of the rostrum. The rostral formula of *P. ortmanni* runs as follows:

$$\frac{2\text{–}3)\ 7\text{–}9 + 2\text{–}3}{7\text{–}9}$$

in *Palaemon gravieri* it is:

$$\frac{2\text{–}3)\ 12\text{–}17 + 4}{5\text{–}6}$$

The rostrum in *P. gravieri* shows the same slender shape as in *P. ortmanni* (in Ortmann's, 1890, figure the rostrum is drawn too slender). It is possible that *P. ortmanni* and *P. gravieri* only form two extremes of a variable species; this, however, only can be proved by more material.

Distribution: The species is known from: Korea (Yoshida, 1941; Kubo, 1942), Tientsin and Tangkoo, China (Yu, 1930a).

Palaemon (*Palaemon*) *serrifer* (Stimpson) (fig. 18)

Leander serrifer Stimpson, 1860, Proc. Acad. nat. Sci. Philad., 1860, p. 41.
Leander serrifer De Man, 1881, Notes Leyden Mus., vol. 3, p. 139.
Leander serrifer Ortmann, 1890, Zool. Jb. Syst., vol. 5, p. 525, pl. 37 fig. 17.
Leander serrifer Doflein, 1902, Abh. Bayer. Akad. Wiss., vol. 21, p. 640.
Palaemon serrifer Rathbun, 1902b, Proc. U. S. Nat. Mus., vol. 26, p. 52.
Leander serrifer Balss, 1914, Abh. Bayer. Akad. Wiss., suppl. vol. 2 pt. 10, p. 57.
non *Leander serrifer* Stebbing, 1914, Ann. S. Afr. Mus., vol. 15, p. 31.
Palaemon (*Leander*) *serrifer* Gee, 1925, Lingnaam agric. Rev., vol. 3, p. 158.
Leander serrifer Kemp, 1925, Rec. Indian Mus., vol. 27, p. 305.
Leander serrifer Urita, 1926, Dobuts Zasshi, vol. 38, p. 428.
Palaemon (*Leander*) *serrifer* Kellogg, 1928, Lingnan Sci. Journ., vol. 5, p. 352.
Leander serrifer Yokoya, 1930, Sci. Rep. Tohôku Imp. Univ., ser. 4 vol. 5, p. 543.
Leander Fagei Yu, 1930a, Bull. Soc. zool. France, vol. 55, p. 561, fig. 2.
Leander serrifer Yu, 1930a, Bull. Soc. zool. France, vol. 55, p. 567, figs. 4A-C.
Leander serrifer longidactylus Yu, 1930a, Bull. Soc. zool. France, vol. 55, p. 570, figs. 4 B′, C′.
Leander serrifer Kubo, 1937, Bull. Japan. Soc. sci. Fish., vol. 5, p. 346, figs. 1D, 2G, 2H, 3N, 3O, 3P, 3Q.
Leander serrifer Kubo, 1942, Journ. Imp. Fish. Inst. Tokyo, vol. 35, p. 33, figs. 8, 9, 19C, N, 20C, 21C, 22C, 23C, J, 24C, N, 25C, C′, 26C, P, 27C, M, 28B, K, 29C, 30.

Museum Leiden

Amoy, China; leg. G. Schlegel. — 167 specimens (included ovigerous females) 34-48 mm.
Northcoast of Java; 1906; leg. P. Buitendijk. — 1 ovigerous female 34 mm.
Northcoast of Java near Tandjong Priok; 1906; leg. P. Buitendijk. — 1 specimen 29 mm.
Southcoast of Madura; 1914; leg. P. Buitendijk. — 7 specimens (included ovigerous females) 32-38 mm.

Description: The rostrum (fig. 18a) is straight with the distal part often slightly curved upwards, it reaches to or slightly (with 1/5 of its length) beyond the apex of the scaphocerite. The upper margin is provided with 9 to 16 small teeth, the first two or three of which are placed on the carapace behind the orbit. The distance between the first and the second tooth is larger than that between the second and the third. The intervals beween the teeth become larger distally, the last and the penultimate tooth often are separated by a large interspace. There are one or two subapical teeth on the rostrum, which in some specimens are removed rather far from the apex. The lower margin of the rostrum bears 3 to 5 (generally 4) strong teeth. On both upper and lower margin there is a single row of setae.

The antennal and branchiostegal spines are of about the same strength. The branchiostegal spine is placed on the anterior margin of the carapace. The anterolateral angle of the carapace is about rectangular with a rounded apex.

The sixth abdominal segment is 1.5 times as long as the fifth.

The telson is somewhat longer than the sixth abdominal segment. The anterior pair of spines

is situated in or slightly beyond the middle of the telson, the posterior pair is placed about midway between the anterior pair and the posterior margin of the telson.

The eyes are normal in shape. A distinct ocellus is present.

The stylocerite (fig. 18b) is long and slender, it reaches about to the middle of the basal segment of the antennular peduncle. The anterolateral spine of the basal segment reaches as far forwards as the middle of the second segment. The anterior margin of the basal segment is convex, but does not overreach the anterolateral spine. The third segment of the peduncle is about 1.5 times

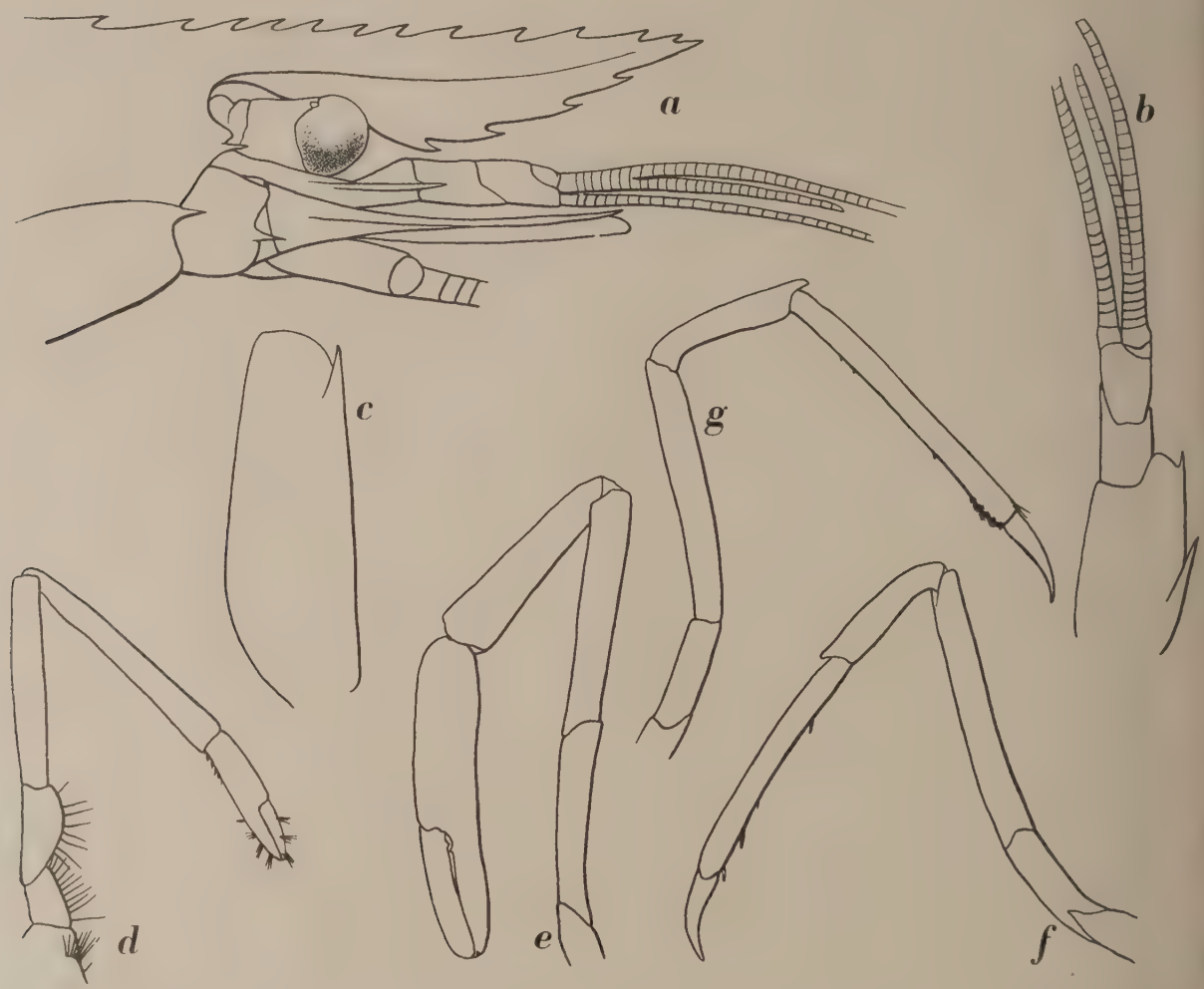

Fig. 18. *Palaemon* (*Palaemon*) *serrifer* (Stimpson). a, anterior part of body in lateral view; b, antennula; c, scaphocerite; d, first pereiopod; e, second pereiopod; f, third pereiopod; g, fifth pereiopod. a-g, × 8.

as long as the second; together the second and third segments are somewhat shorter than the basal segment. The upper antennular flagellum has the two rami fused for 5 to 8 joints, the free part of the shorter ramus consists of 18 to 26 joints, being thereby thrice as long as the fused portion. The inner margin of the shorter ramus is not so distinctly serrate as in *Palaemon pacificus*.

The scaphocerite (fig. 18c) reaches with $^1/_5$ to $^1/_6$ of its length beyond the antennular peduncle.

It is somewhat less than or quite thrice as long as broad. The lamella slightly overreaches the final tooth.

The oral parts are quite typical and do not show any remarkable feature. The third maxillipede reaches to or somewhat beyond the end of the antennal peduncle. The last joint is about $^3/_4$ of the length of the penultimate joint and about half as long as the antepenultimate.

The first pereiopod (fig. 18d) is slender, it reaches to or with the fingers beyond the end of the scaphocerite. The fingers are slender and somewhat shorter than the palm. The carpus is about 1.5 times as long as the chela. The merus is somewhat shorter than the carpus. The ischium is half as long as the merus. The second pereiopod (fig. 18e) is strong, it is very variable in length, in some specimens it reaches with the chela, in others with the chela and a part of or even with the entire carpus beyond the scaphocerite. The fingers are slender; the palm is 1.4 to 1.8 times as long as the fingers. The dactylus bears two, the fixed finger one tooth in the proximal part of the cutting edge, these teeth sometimes are very inconspicuous. The palm is cylindrical. The carpus is as long as or somewhat longer than the palm, it varies from $^2/_3$ to $^3/_5$ of the length of the entire chela. The merus is about as long as the carpus. The ischium has about $^2/_3$ of the length of the merus. The last three pereiopods are rather slender. The third pereiopod (fig. 18f) reaches with a part of or with the entire dactylus beyond the scaphocerite. The propodus is 2.6 to 3 times as long as the dactylus. The posterior margin of the propodus bears some 4 to 6 scattered spinules. The carpus is half as long as the propodus. The merus is as long as the propodus. The ischium is half as long as the merus. The fourth pereiopod is similarly built as the third, it only is slightly more slender and reaches a little farther forwards. The fifth pereiopod (fig. 18g) reaches as far forwards as the third. The propodus is 3 to 4 times as long as the dactylus, it is similarly built as the third, only the posterior margin of the propodus bears, apart from the scattered spinules, the usual transverse rows of setae.

The endopod of the first pleopod of the male is ovate, there is no trace of an appendix interna. The other pleopods are quite normal in shape.

The specimens from Amoy have already been recorded by De Man (1881).

Leander Fagei of Yu (1930a) entirely agrees with the present species. According to Yu himself (p. 555) the difference between the two species is that in *Leander Fagei* the rostrum has a larger part curved upwards than in *P. serrifer*. This character, however, in my opinion is too vague and too variable to be used for specific distinction; in my rather large material from Amoy for instance all transitions between Yu's two species occur, so that of many of the specimens it is impossible to say to which of the two forms it belongs. Yu, moreover, figures the second chela of his *Leander Fagei* somewhat more robust than that of his *Leander serrifer*, but this character too is variable. As in all other characters there is the closest resemblance between the two forms, I can not keep them separate. In the same paper Yu distinguishes some specimens of *Palaemon serrifer* as a distinct variety *longidactylus*. This variety is said to differ from the main form in three points:

1. In the typical form the first two teeth of the rostrum are situated behind the posterior orbital margin, in the var. *longidactylus* three teeth.

2. The fused portion of the two rami of the upper antennular flagellum in var. *longidactylus* consists of 5 or 6, the free portion of 23 to 26 joints, in the typical form these numbers are respectively 5 to 7 and 19 to 23.

3. In var. *longidactylus* the relation between the length of the carpus and the chela of the

second leg varies between 0.69 and 0.98, and the relation between the length of the palm and the fingers of that leg varies between 1.14 and 1.30. These relations in the typical form are respectively 0.70 to 0.85 and 1.43 to 1.60.

The first character is very variable, sometimes the third tooth of the upper margin of the rostrum is placed behind, sometimes above and sometimes before the posterior limit of the orbit and it is in no way connected with the number of free joints of the shorter ramus of the upper flagellum, which in my material varies freely between 18 and 26. The relation between the lengths of the carpus and chela of the second leg is of no value at all, as that of the typical form falls entirely within the range of that of the variety. The relation between the length of the fingers and that of the palm of the second leg too is variable: in Kemp's material it varied between 1.4 and 1.7, in my material between 1.35 and 1.8. In Yu's material of the variety *longidactylus* the fingers of the second leg indeed are longer than in the typical material, but this difference is very small. If the variety *longidactylus* must be considered as a separate form, then its only difference with the typical form lies in the relatively longer fingers of the second legs.

The specimen recorded by Stebbing (1914) from Port Elizabeth belongs to *P. capensis* as is pointed out by Barnard (1947).

Distribution: The species is a marine litoral form. It is reported in literature from: Bandra near Bombay (Kemp, 1925), Byick Hwaaw Bay and Daimond Island off Cape Negrais, Burma (Kemp, 1925), Jack and Una Island and Paway Island, Mergui Archipelago (Kemp, 1925), ? Hakodate, Yesso, Japan (Doflein, 1902), Fukikoshi and Sai Bay, Mutsu Bay (Yokoya, 1930), Kominato (Balss, 1914; Kubo, 1942), Tokio Bay (Ortmann, 1890), Tokio (Balss, 1914), Tanagawa (Ortmann, 1890), Yokohama (Doflein, 1902), Sagami Bay (Balss, 1914), Misaki (Rathbun, 1902b; Balss, 1914), Aburatsubo (Balss, 1914), Atami (Rathbun, 1902b), Oshima (Stimpson, 1860), Nagasaki (Balss, 1914), Vladivostoc (Balss, 1914), Peitaiho (Yu, 1930a), Tangkoo Yu, 1930a), Shantung peninsula (Yu, 1930a), Chefoo (Yu, 1930a), Tsingtao (Doflein, 1902; Urita, 1926), Hangchow (Balss, 1914), Wenchow (Gee, 1925; Kellogg, 1928), Foochow (Kellogg 1928), Amoy (De Man, 1881; Gee, 1925; Kellogg, 1928), Hongkong (Stimpson, 1860; Kellogg, 1928), Making, Pescadores Islands (Balss, 1914), Yangmatao (Yu, 1930a) (the exact position of the last locality is unknown to me). The present specimens from Java largely extend our knowledge of the range of distribution of this species.

Palaemon (*Palaemon*) *longirostris* H. Milne Edwards

De Man (1924) erected a new variety of this species for the specimens of the Dutch estuaries; this variety also was found in the S.W. of France (Biarritz and the mouths of the rivers Adour and Nivelle). This form was named by the Dutch carcinologist *Leander longirostris* var. *robusta*. The only typical specimens of the species examined by De Man originated from the Guadalquivir near Sevilla. The specimens on which H. Milne Edwards's original description is based came from the Garonne. These specimens may be expected to belong to the same form as those from the other rivers of S. W. France; De Man, however, considered Milne Edwards's specimens to belong to the same form as the specimens from the Guadalquivir, because in the latter the rostrum is longer than in the specimens from the Atlantic coasts. Milne Edwards in his

description, however does not give characters which make it certain that his specimens belong to one of the two forms; as from the southwest coast of France after thorough investigations only the form *"robusta"* is found, we may safely consider it certain that Milne Edwards's specimens belong to that form. Thus the specimens from the estuaries of England, Germany, Holland, Belgium and W. France are the typical *Palaemon longirostris,* while the specimens from the Guadalquivir may belong to a separate variety. As the entire collection of *Palaemon* species of Dr. J. G. de Man at present is preserved in the Zoological Museum at Amsterdam, I had the opportunity to examine all specimens mentioned in De Man's papers. The specimens from Sevilla indeed are more slender than those from the Atlantic coasts, they have the legs more slender and the rostrum longer, but I hesitate to give them a new name, as there is very little known about the shape of the specimens from other southern localities and the variability of the length of the rostrum and the legs in those specimens.

Palaemon (*Palaemon*) *squilla* (Linnaeus)

As already pointed out on p. 55 the species named here *Palaemon squilla* is not the form indicated by most authors under the name *Leander* or *Palaemon squilla,* but is identical with their *Leander* (or *Palaemon*) *adspersus. Leander Brandti* Czerniavsky, according to the description, differs from the present species by having the merus as long as the carpus and the palm (not the chela as Kemp, 1925, p. 294 states) together. It is possible, however, that Czerniavsky overlooked the articulation between the ischium and the merus and considered them to be one segment, namely his "brachium"; in that case the brachium indeed is as long as the carpus and the palm together. Only examination of Czerniavsky's type specimen, however, can give final certainty in this matter.

De Man (1915a) divided the present species into two forms, the typical form from the Black Sea and the var. *Fabricii* from the Baltic Sea, the westcoast of Europe and the Mediterranean. The differences are based on the dentition of the rostrum (the formula in the typical form being generally $\frac{5}{4}$ and in the variety $\frac{6}{3}$) and by the fact that in the typical form the rostrum reaches "especially in young and middle-sized specimens, sometimes also in adult individuals" more or less far beyond the end of the shorter ramus of the antennular peduncle, while in the var. *Fabricii* the shorter ramus reaches beyond the rostrum. In my opinion these two forms can not be kept separate. In the material at my disposal, which includes all material examined by De Man, the rostral formula of specimens from the Black Sea, as well as those from the other regions, is variable and both may bear 5 or 6 upper and 3 or 4 lower teeth. The second character too can not be used to separate two varieties, as in the young specimens from the Black Sea as well as those from Finland, which are at my disposal, the rostrum reaches beyond the shorter ramus of the upper antennular flagellum, while in adult specimens from those two and other regions the ramus generally reaches beyond the rostrum. In my opinion therefore it is not possible to keep the two forms separate. By most authors the varietal names were given to the forms only on account of the locality from where the material originated.

Palaemon (*Palaemon*) *pacificus* (Stimpson) (fig. 19)

Palaemon Quoianus Krauss, 1843, Südafr. Crust., p. 55 (non H. Milne Edwards, 1837).
Leander pacificus Stimpson, 1860, Proc. Acad. nat. Sci. Philad., 1860, p. 40.

Leander affinis p.p. Miers, 1876, Catal. Crust. New Zeal., p. 85.
Leander pacificus De Man, 1881, Notes Leyden Mus., vol. 3, p. 137.
Leander pacificus De Man, 1888, Arch. Naturgesch., vol. 53 pt. 1, p. 559.
Leander pacificus Borradaile, 1899, Willey's Zool. Results, vol. 4, p. 410.
Leander pacificus Doflein, 1902, Abh. Bayer. Akad. Wiss., vol. 21, p. 639.
Leander pacificus De Man, 1902, Abh. Senckenb. naturf. Ges., vol. 25, p. 806.
Palaemon pacificus Rathbun, 1902b, Proc. U. S. Nat. Mus., vol. 26, p. 53.
Leander pacificus Nobili, 1906b, Ann. Sci. nat. Zool., ser. 9 vol. 4, p. 73.
Palaemon pacificus Rathbun, 1906, Bull. U. S. Fish Comm., vol. 23, p. 924, pl. 22. fig. 3.
Palaemon quoianus Stebbing, 1910, Ann. S. Afr. Mus., vol. 6, p. 384.
Leander squilla Stebbing, 1910, Ann. S. Afr. Mus., vol. 6, p. 386.
Leander pacificus Balss, 1914, Abh. Bayer. Akad. Wiss., suppl. vol. 2 pt. 10, p. 57.
Leander affinis p.p. Lenz & Strunck, 1914, Deutsche Südpolar Exped., vol. 15, p. 322.
Leander affinis Stebbing, 1914a, Trans. Roy. Soc. Edinb., vol. 50 pt. 2, p. 287.
Leander pacificus Balss, 1915, Denkschr. Akad. Wiss. Wien, vol. 91 suppl., p. 31.
Leander peringueyi Stebbing, 1915, Ann. S. Afr. Mus., vol. 15, p. 75, pl. 17.
Leander gilchristi Stebbing, 1915, Ann. S. Afr. Mus., vol. 15, p. 76, pl. 18.
Leander pacificus Stebbing, 1917, Ann. S. Afr. Mus., vol. 17, p. 34, pl. 4B.
Palaemon (*Leander*) *pacificus* Gee, 1925, Lingnaam agric. Rev., vol. 3, p. 158.
Leander pacificus Kemp, 1925, Rec. Indian Mus., vol. 27, p. 307.
Leander pacificus Balss, 1927, Trans. zool. Soc. Lond., vol. 22, p. 223.
Leander pacificus Gurney, 1927, Trans. zool. Soc. Lond., vol. 22, p. 229.
Leander pacificus Yu, 1930a, Bull. Soc. zool. France, vol. 55, p. 555.
Leander pacificus Kubo, 1937, Bull. Japan. Soc. sci. Fish., vol. 5, p. 346, figs. 1C, 2D, 2E, 2F, 3D, 3E, 3F, 3G, 3H, 3K, 3L, 3M.
Leander pacificus Gurney, 1938, Sci. Rep. Great Barrier Reef Exped., vol. 6, p. 3, figs. 1-7.
Leander pacificus Kubo, 1942, Journ. Imp. Fish. Inst. Tokyo, vol. 35, p. 42, figs. 10, 11, 12, 19B, M, 20B, 21B, 22B, 23B, I, 24B, M, 25B, B', 26B, O, 27B, L, 29B, 31.
Leander pacificus Edmondson, 1946, Spec. Publ. Bishop Mus. Honolulu, vol. 22, p. 251, fig. 152d.
Leander pacificus Barnard, 1947, Ann. Mag. nat. Hist., ser. 11 vol. 13, p. 390.

Snellius Expedition

Kambang; shore and reef; November 26-28, 1929. — 4 specimens (included ovigerous females) 44-51 mm.

Museum Leiden

Amboina; 1879; leg. Schorel. — 4 specimens 41-45 mm.
Ternate; 1893-1894; leg. W. Kükenthal. — 2 specimens 37 and 46 mm.
Honolulu; May 12, 1917; leg. P. Buitendijk. — 1 ovigerous ♀ 43 mm.

Museum Amsterdam

Durban; October 3, 1894; leg. M. Weber. — 2 specimens 18 and 24 mm.
Durban, mangrove swamps; 1894; leg. M. Weber. — 9 specimens (included 1 ovigerous female) 17-44 mm.
Knysna, S. Africa; October, 1894; leg. M. Weber. — 14 specimens (included ovigerous females) 41-53 mm.

Amboina; leg. J. Brock; coll. J. G. de Man. — 1 specimen 44 mm.

The specimens agree with K e m p ' s (1925) description. In my specimens the stylocerite (fig. 19b) is slender, but just fails to reach the middle of the basal segment of the antennular peduncle.

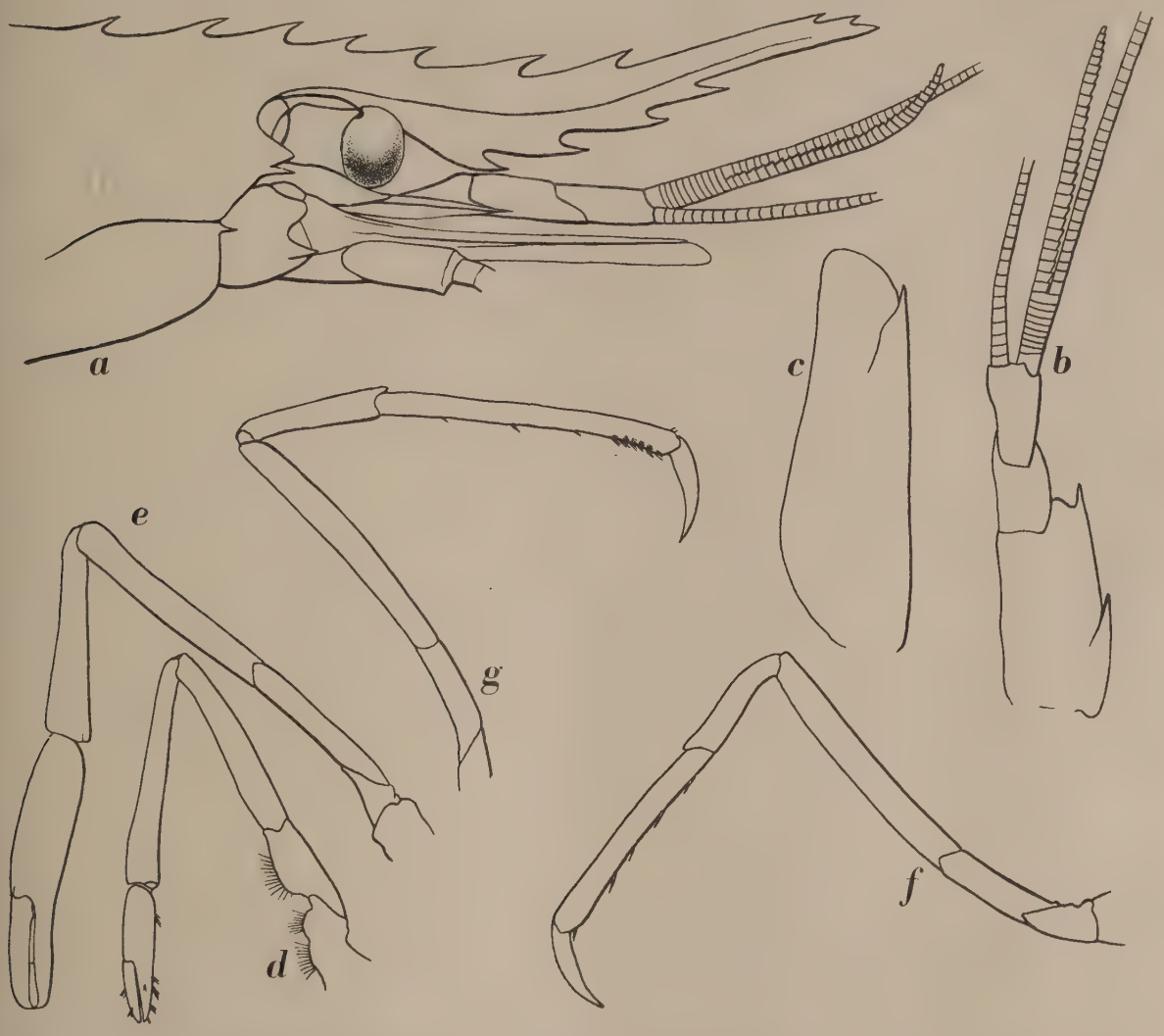

Fig. 19. *Palaemon* (*Palaemon*) *pacificus* (Stimpson). a, anterior part of body in lateral view; b, antennula; c, scaphocerite; d, first pereiopod; e, second pereiopod; f, third pereiopod; g, fifth pereiopod. a-g, × 8.

The third maxillipede reaches with half the ultimate joint beyond the antennal peduncle. The ultimate segment is about $^{2}/_{3}$ of the length of the penultimate and half the length of the antepenultimate. The first pereiopod has the carpus slightly longer than the merus and not slightly shorter as stated by K e m p. The fingers of the second pereiopod both bear one small tooth in the proximal part of the cutting edge. The oral parts are typical. The endopod of the first pleopod of the male is ovate with the inner margin concave, no trace of an appendix interna is visible there. The other pleopods are quite normal.

As already pointed out by Barnard (1947), the specimens recorded from S. Africa under the names *Palaemon quoianus*, *Leander affinis*, *Leander squilla*, *L. peringueyi* and *L. gilchristi*, belong to the present species. *Palaemon affinis* does not occur in S. Africa, *L. peringueyi* and *L. gilchristi* are based on specimens of *Palaemon pacificus* with a deformed rostrum.

The specimen from Amboina in the collection of the Leiden Museum has already been mentioned by De Man (1881), that from Ternate in De Man's (1902) paper, while the Amboina specimen in the collection of the Zoological Museum at Amsterdam is inserted in the 1888 paper of the same author.

Distribution: This litoral form is known from the following localities: Red Sea (Nobili, 1906), Little Bitter Lake, Suez Canal (Balss, 1927), Suez (Balss, 1927), Ain Musa, Gulf of Suez (Kemp, 1925; Balss, 1927), Tor, Gulf of Suez (Kemp, 1925), Naiwibi (= ? Nuebe, Gulf of Aquaba) (Balss, 1915), Ghardaqa, Red Sea (Gurney, 1938), Cape of Good Hope (Krauss, 1843; Miers, 1876; Nobili, 1906), Saldanha Bay, S. Africa (Stebbing, 1914a), Reitz Bay (Stebbing, 1914a), Capetown (Lenz & Strunck, 1914), Table Bay and False Bay to East London, Cape Province (Barnard, 1947), False Bay (Stebbing, 1910), Mosselbay (Stebbing, 1917), Knysna (Barnard, 1947), Port Elizabeth (Barnard, 1947), East London (Stebbing, 1915), off Delagoa Bay, Portuguese E. Africa, 33° 49′ S, 25° 56′ E (Stebbing, 1915), Karachi (Kemp, 1925), Mormugao Bay, Portuguese India (Kemp, 1925), Cape Comorin, S. India (Kemp, 1925), Kominato, Hondo, Japan (Kubo, 1942), Sagami Bay (Doflein, 1902), Misaki (Rathbun, 1902b), Dzushi, Fukuura and between Ito and Hatsushima, Sagami Bay (Balss, 1914), Oshima (Kubo, 1942), Shimoda (Stimpson, 1860; Kubo, 1942), Miya (Kubo, 1942), Wakanoura, Hondo (Rathbun, 1902b), Nobeoka and Itiki, Kyushyu (Kubo, 1942), Nagasaki (Rathbun, 1902b), Hongkong (Stimpson, 1860), Ternate, Moluccas (De Man, 1902), Amboina, Moluccas (De Man, 1881, 1888), Isle of Pines, New Caledonia (Borradaile, 1899), Honolulu, Oahu, Hawaiian Archipelago (Rathbun, 1906), Hawaii (Stimpson, 1860; Edmondson, 1946), Hilo, Hawaii (Rathbun, 1906).

Palaemon (*Palaemon*) *serratus* (Pennant)

De Man (1915a) distinguished the form described by Risso under the name *Melicerta Triliana* and which by other authors was named *Palaemon* (or *Leander*) *treillianus*, as a variety of the present species. The variety is said to differ from the main form by having the shorter ramus of the upper antennular flagellum longer than in the typical form (reaching 4.5 to 4.6 mm beyond the tip of the rostrum instead of 2.5 mm) and by having the second joint of the mandibular palp somewhat broader (1.7 times as long as thick instead of 2.5 to 2.7 times). In the large material at my disposal, which includes all material examined by De Man, these two characters showed to be too variable to be of even varietal value. The variety *treillianus* therefore is suppressed here. In the collection of the Zoological Museum at Amsterdam two specimens of the present species are present, which were sent by Mr. S. F. Gimenez to Dr. J. G. de Man under the name *Palaemon rostratus* Gimenez and which were captured near St. Jean de Luz (S. W. France). These specimens were identified by Dr. de Man as *Leander serratus*. Herewith the identity of Gimenez's species, which never has been described and the name of which is published only as a nomen nudum in his (1922) article, is established.

Palaemonetes Heller, 1869

Kemp (1925) gave a revision of this genus, with a key to all species known to him at that moment. The following species have been described as new after the publication of Kemp's paper: *Palaemonetes chankensis* Buldovsky (1933), *Palaemonetes venephicus* Birstein & Vinogradov (1934), *Palaemonetes carteri* Gordon (1935), *Palaemonetes zariquieyi Sollaud* (1938), *Palaemonetes pacificus* Gurney (1939), *Palaemonetes gibarensis* Chace (1943), and *Palaemonetes inermis Chace* (1943). *P. chankensis* and *P. venephicus* both are synonymous with *P. sinensis* (Sollaud), while *Palaemonetes pacificus* is based on a specimen of *Palaemon debilis*. Both *P. gibarensis* and *P. inermis* are transferred now to the genus *Troglocubanus*, just like the species *P. calcis* and *P. eigenmanni*, which were included by Kemp in the genus *Palaemonetes*. Another species considered by Kemp (1925) to be a *Palaemonetes* is here removed from that genus; this species is *Palaemonetes hornelli* Kemp, which is now placed in the genus *Leandrites* and is identified with *Leandrites celebensis* (De Man).

Sollaud (1938) divided the European and Mesopotamian *Palaemonetes* forms into 5 species: *Palaemonetes varians*, a brackish water form ranging from the W. Baltic and the North Sea to the westcoast of Morocco and penetrating into the western Mediterranean, *Palaemonetes antennarius*, which lives in the fresh waters of Italy and the Balkans, *P. Zariquieyi* from the very slightly brackish (oligohaline) water of the Gulf of Valencia, *P. mesogenitor* from fresh water of Tunisia and Algeria and *P. mesopotamicus* from fresh water of Mesopotamia. A key is given by Sollaud to these species. I do not know if *P. antennarius, mesopotamicus* and *zariquieyi* really can be maintained as distinct species. Examination of abundant material from various localities of the Mediterranean region is much needed. So for instance in the collection of the Rijksmuseum van Natuurlijke Historie at Leiden a specimen from Barcelona is preserved, which certainly does not belong to *P. zariquieyi*, but to *P. antennarius*. In the list of the species of the present genus (p. 9-11) I have treated, provisionally at least, the forms as separate species.

One indo-westpacific species of *Palaemonetes* is at my disposal:

Palaemonetes sinensis (Sollaud) (figs. 20, 21)

Allocaris sinensis Sollaud, 1911, Bull. Mus. Hist. nat. Paris, vol. 17, p. 50, figs. 1, 2.
Palaemonetes sinensis Kemp, 1918a, Mem. Asiat. Soc. Bengal, vol. 6, p. 272.
Palaemonetes (*Allocaris*) *sinensis* Sollaud, 1923, Bull. biol. France Belg., vol. 57, p. 589.
Palaemon sinensis Gee, 1925, Lingnaam Agric. Rev., vol. 3, p. 158.
Palaemonetes sinensis Kemp, 1925, Rec. Indian Mus., vol. 27, p. 316.
Palaemonetes chankensis Buldovsky, 1933, Bull. Far East. Br. Acad. Sci. U.S.S.R., 1933, p. 43, pl. 1, pl. 2 figs. 12-16, 18, 19.
Palaemonetes venephicus Birstein & Vinogradov, 1934, Zool. Journ. Moscow, vol. 13, p. 45, fig. 3.
Palaemonetes sinensis Birstein, 1939, Zool. Journ. Moscow, vol. 18, pp. 55, 61.
Palaemonetes sinensis Birstein, 1941, Life Freshw. U.S.S.R., vol. 1, p. 424.

Museum Amsterdam:

Marsh near Tientsin, China; May, 1909; leg. Miss A. Hüllmann. — 6 specimens 22-46 mm.

The present specimens perfectly agree with Sollaud's and Kemp's descriptions. The rostrum (fig. 20a) is straight, it bears 5 or 6 upper and 1 or 2 lower teeth, the tip of the rostrum in

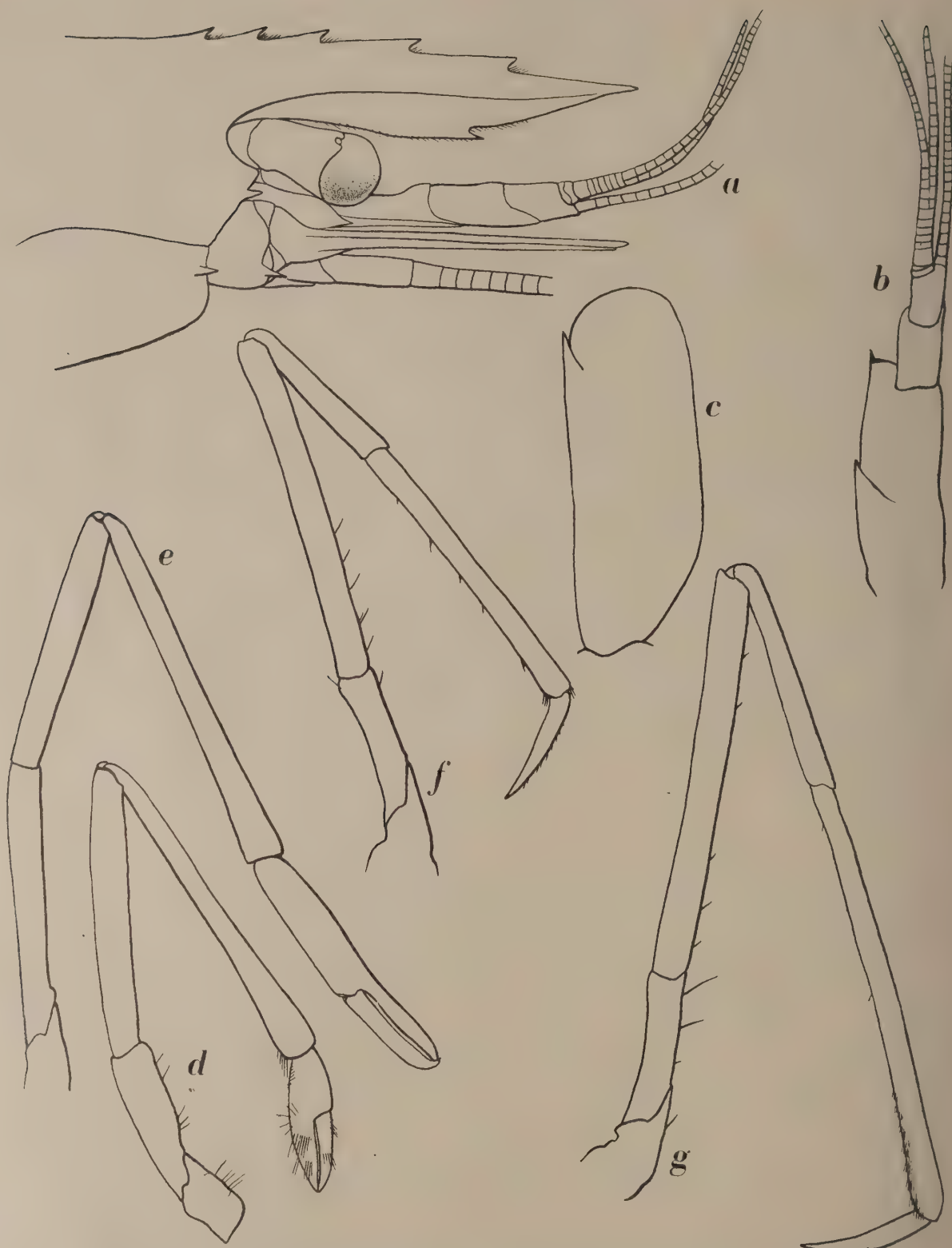

Fig. 20. *Palaemonetes sinensis* (Sollaud). a, anterior part of body in lateral view; b, antennula; c, scaphocerite; d, first pereiopod; e, second pereiopod; f, third pereiopod; g, fifth pereiopod. a-g, × 10.

all my specimens is simple and reaches about to the end of the scaphocerite. The first dorsal tooth of the rostrum generally is placed on the carapace behind the orbit; in one specimen at my disposal, however, all the dorsal teeth are situated on the rostrum proper. The carapace is smooth. The antennal spine is placed some distance below the rounded lower orbital angle. The branchiostegal spine is about as strong as the antennal, it is placed slightly behind the anterior margin of the carapace; this distance, however, is so small, that the spine reaches with the larger part of its length beyond the margin. The branchiostegal groove is distinct.

The abdomen is smooth. The first three segments have the pleurae broadly rounded, the pleurae of the fourth and fifth segment are narrower, but have the apex rounded too. The sixth segment is somewhat longer than the fifth.

The telson is slightly longer than the sixth abdominal segment. Its dorsal surface bears two pairs of spinules, the anterior of which is situated in the middle of the telson, the posterior pair halfway between the anterior pair and the posterior margin of the telson. The telson ends in a distinct sharp median point, which is flanked at each side with the two usual spines; between the two longer spines four pairs of feathered setae and one unpaired seta are present.

The eyes are well developed. The cornea is shorter and somewhat broader than the stalk, it is distinctly pigmented and is provided with an ocellus.

The basal segment of the antennular peduncle (fig. 20b) is broad, the stylocerite is slender and pointed, it does not reach the middle of the basal segment. The anterolateral angle of the basal segment ends in a distinct spine, which overreaches the convex anterior margin of the basal segment. The second segment of the peduncle is about as long as the third segment, when measured in dorsal line. The two rami of the upper antennular flagellum are fused for 6 to 8 joints, the free part of the shorter ramus consists of 15 to 18 joints and is 3 or 4 times as long as the fused part.

The scaphocerite (fig. 20c) is about $2^3/_4$ as long as broad, the outer margin is convex in the distal part; the final tooth of the outer margin fails to reach the rounded end of the lamella.

The mandible (fig. 21a) has the incisor process ending in three teeth, the molar process ends in blunt knobs, no palp is present on the mandible. The inner lacinia of the maxillula (fig. 21b) is rather broader than in other species of the genus. The maxilla (fig. 21c) is normal in shape. The first maxillipede is peculiar in shape, the coxa and basis namely are widely separated, moreover the epipod is small. The second and third maxillipede are normal in shape. The last joint of the third maxillipede measures $^3/_4$ of the length of the penultimate joint, the antepenultimate joint is about 1.5 times as long as the penultimate. The last joint of the third maxillipede reaches to the end of the basal segment of the antennular peduncle.

The first pereiopod (fig. 20d) reaches to the end of the scaphocerite. The chela is rather broad. The fingers are longer than the palm. The carpus is almost 2.5 times as long as the chela and it is $^1/_5$ longer than the merus. The second leg (fig. 20e) is slender, it reaches with almost the entire chela beyond the scaphocerite. The fingers are slender, they are little more than $^2/_3$ as long as the palm. The carpus is somewhat more than $^4/_3$ as long as the chela, while the merus is about as long as the chela. The third pereiopod (fig. 20 f) largely fails to reach the end of the scaphocerite, while the fifth pereiopod reaches to or slightly beyond the tip of that scale. The propodus of the third pereiopod is almost 2.5 times as long as the dactylus, there are some spinules present along the posterior margin. The carpus is somewhat less than $^2/_3$ as long as the propodus. The merus is

longer than the propodus. The fourth pereiopod is somewhat more slender than the third. The fifth leg (fig. 20g) is still more slender; here the propodus is about thrice as long as the dactylus; the posterior margin of the propodus bears, apart from some scattered spinules, several transverse rows of hairs, which are placed in the distal part. The carpus is almost half as long as the propodus. The merus is slightly shorter than the propodus.

The pleopods are normal in shape. The endopod of the first pleopod of the male (fig. 21d) is ovate, with the inner margin concave, there is no trace of an appendix interna. The second pleopod

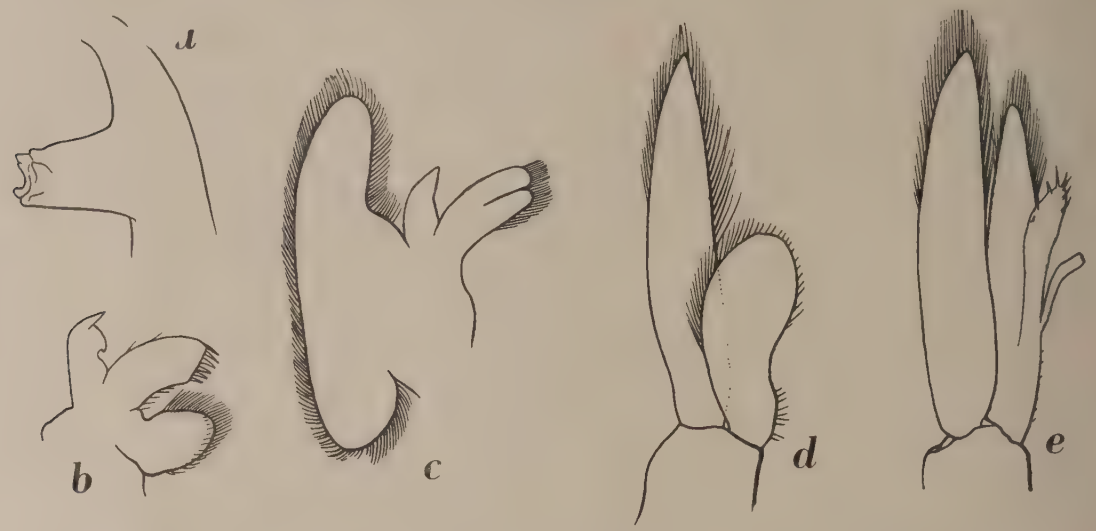

Fig. 21. *Palaemonetes sinensis* (Sollaud). a, mandible; b, maxillula; c, maxilla; d, first pleopod of male; e, second pleopod of male. a-e, × 14.

of the male (fig. 21e) has the appendix masculina broadened towards the top and provided there with some spinules, this appendix masculina is much shorter than the endopod and distinctly longer than the appendix interna.

The uropods are normal in shape, they are longer than the telson. The outer margin of the exopod is slightly convex and ends in a distinct tooth, which at its inner side is provided with a movable spinule.

My specimens were found together with *Palaemon modestus* (Heller), *Macrobrachium asperulum* (Von Martens) and *Caridina denticulata* (De Haan).

The specimens described by Birstein & Vinogradov (1934) as new under the name *Palaemonetes venephicus,* show no difference with the present species as far as can be ascertained from the description and figures of the Russian authors, so that it is considered here to be a synonym of the present species. A year before the publication of Birstein & Vinogradov's paper Buldovsky (1934) described from the same region a new species of *Palaemonetes* too; this species was named by him *P. chankensis.* Birstein (1939) pointed out that, just like *P. venephicus, P. chankensis* is identical with *P. sinensis.*

Distribution: The present species has been collected in fresh waters of E. Siberia and China. The records in literature are: Santacheza, Liu and Chantacheza, E. Siberia (Birstein, 1939), Lake

Pir (Buldovsky, 1933), Lake near Daubiche, S.E. Siberia (Birstein & Vinogradov, 1934), Peiping (Sollaud, 1911, 1923), Shanghai (Kemp, 1918a).

Leptocarpus nov. gen.

Definition: Rather large and slender prawns. Body slender and compressed. Rostrum well developed, long, provided with teeth on both margins. Upper margin with the basal teeth placed on an elevated crest. A single row of hairs is present on the upper margin, while the lower margin bears a double row, which are placed on the margin proper. The carapace is smooth and provided with antennal spines only. These antennal spines are placed some distance below the rounded orbital angles. A distinct and sharp branchiostegal groove is present, it is situated at the same place as that of the members of *Palaemon.* The abdomen is smooth. The pleurae of the first three segments are broadly rounded, those of the fourth and fifth segments are narrower, but both end in a rounded apex. The sixth segment has the pleurae very short and pointed, the posterolateral angle is pointed too. The sixth segment is distinctly longer than the fifth. The telson is about as long as the sixth segment, it is elongate triangular and is provided with two pairs of dorsal spines. The posterior margin of the telson ends in a sharp median point which is flanked by two pairs of spines; the outer pair of these spines is much shorter than the inner pair. Between the two longer spines a pair of feathered setae is present.

The eyes are well developed, and bear a hemisphaerical cornea, which is provided with black pigment. An ocellus is present.

The basal segment of the antennular peduncle is broad and is provided with a stylocerite, which is sharply pointed. The anterolateral spine of the basal segment is rather weak, it reaches about to the middle of the second segment. The anterior margin of the basal segment is convex, but reaches little or not at all beyond the base of the anterolateral spine. The second segment of the peduncle is much shorter than the third. The upper antennular flagellum has the shorter ramus fused for a short distance with the longer, the free part of the shorter ramus is much longer than the fused part.

The scaphocerite is well developed. The lamella distinctly overreaches the final tooth of the outer margin. The antennal peduncle fails to reach the middle of the scaphocerite. A strong external tooth is present at the base of the antennal peduncle.

The mandible (fig. 22a) bears a distinct three-jointed palp; the incisor process ends in three teeth, the molar process bears some blunt knobs and ridges in the distal part, no spines are present. The maxillula (fig. 22b) shows close resemblance to that of *Palaemon,* the inner lacinia is rather slender, the upper lacinia ends in some strong spines, the palp is distinct and bifid. The maxilla (fig. 22c) has the endite deeply cleft, the palp is distinct, the scaphognathite is large. The basis and the coxa of the first maxillipede (fig. 22d) are separated by a deep notch, the palp is well developed, the exopod is large, bearing a distinct caridean lobe at the base; the epipod is deeply bilobed, the tip of the upper lobe is somewhat produced. The second maxillipede (fig. 22e) has the same shape as in *Palaemon,* the exopod is well developed, the epipod bears a distinct podobranch. The third maxilipede is slender and provided with an exopod and an epipod, furthermore an arthrobranch and a pleurobranch are present. The first pereiopod is very slender, the fingers are unarmed and provided with tufts of setae; the carpus is elongate. The second legs are extremely slender, the carpus

here too is very long. The last three pereiopods mutually are equal in shape, the posterior legs are longer than the anteriors, all legs are very slender; the dactylus is simple.

All pleopods except those of the first pair are provided with an appendix interna at the endopod. The endopod of the second pair of the males moreover is provided with an appendix masculina. The endopod of the first pleopods of the male is elongate.

The uropods are distinctly longer than the telson. The endopod is ovate, the exopod is longer

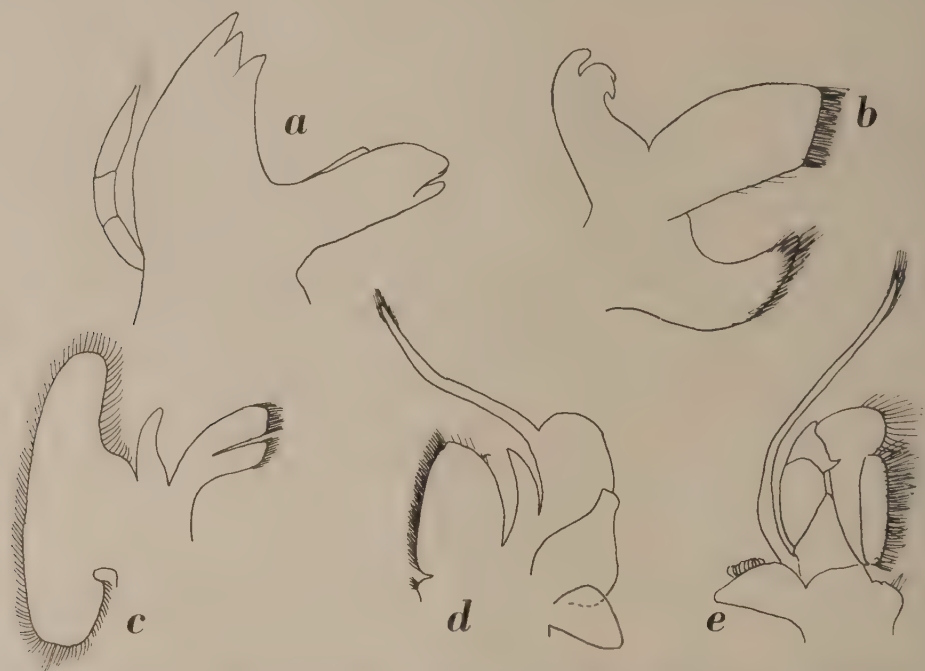

Fig. 22. *Leptocarpus fluminicola* (Kemp). a, mandible; b, maxillula; c, maxilla; d, first maxillipede; e, second maxillipede. a, b, × 27; c-e, × 13.

than the endopod, its outer margin is slightly convex and ends in a strong tooth, which at its inner side is provided with a movable spine. The posterior margin of the exopod is strongly produced posteriorly.

Type: *Leander fluminicola* Kemp, 1917.

The present genus is closely related to the subgenera *Nematopalaemon* and *Exopalaemon* of the genus *Palaemon*, it may, however, at once be recognized by the absence of the branchiostegal spine.

Both species of the present genus are represented in the collections at hand:

Leptocarpus fluminicola (Kemp) (fig. 22)

Leander fluminicola Kemp, 1917, Rec. Indian Mus., vol. 13, p. 223, pl. 9 fig. 2.
Leander fluminicola Kemp, 1925, Rec. Indian Mus., vol. 27, p. 288.

Museum Amsterdam

Pazudaung and Dala Creeks, Rangoon, Burma; August, 1915; leg. N. Annandale; paratypes. — 4 specimens 44-47 mm.

The present specimens formed part of the material on which Kemp's original description is based. They were presented by the Indian Museum to Dr. J. G. de Man, after whose death, they were inserted in the collection of the Amsterdam Museum.

Distribution. The species is known from fresh and slightly brackish water. The only records in literature are those of Kemp from several localities in the United Provinces (India), Bengal and Burma.

Leptocarpus potamiscus (Kemp)

Leander potamiscus Kemp, 1917, Rec. Indian Mus., vol. 13, p. 225, fig. 7.
Leander potamiscus Kemp, 1918a, Mem. Asiat. Soc. Bengal, vol. 6, p. 270.
Leander potamiscus Kemp, 1925, Rec. Indian Mus., vol. 27, p. 288.
Leander potamiscus Rai, 1933, Journ. Bombay nat. Hist. Soc., vol. 36, p. 886.
Leander potamiscus Gordon, 1935a, Ann. Mag. nat. Hist., ser. 10 vol. 16, p. 629.
Palaemon potamiscus Suvatti, 1937, Check-List aquat. Fauna Siam, p. 50.

Museum Leiden

Tandjungmerawa near Medan, N. E. Sumatra; leg. B. Hagen. — 4 specimens 28-50 mm.
Harbour of Belawan Deli; brackish water; December, 1924, leg. P. Buitendijk. — 1 ovigerous female 45 mm.
Belawan Deli, E. coast of Sumatra; June, 1927 and February, 1930; leg. P. Buitendijk. — 44 specimens 34-54 mm.
Tandjong Priok near Batavia; 1907; leg. P. Buitendijk. — 3 specimens (1 ovigerous female) 34-48 mm.
Island Alkmaar, Bay of Batavia; 1906; leg. P. Buitendijk. — 1 ovigerous female 48 mm.
Indramaju, northcoast of West Java; September, 1924; leg. P. Buitendijk. — 9 specimens (included ovigerous females) 52-59 mm.
Tjilatjap, south coast of Central Java; August, 1905; leg. P. Buitendijk. — 1 specimen 42 mm.
Surabaja, E. Java; February, 1927; leg. P. Buitendijk. — 1 ovigerous female 49 mm.

The present specimens agree good with Kemp's description and figure. Most localities in which my material is collected are situated on the coast, where the water is salt or brackish, only Tandjungmerawa is situated 20 to 25 km inland.

Distribution. The species is recorded in literature from: Bombay (Rai, 1933), Sanguem River at Sanvordem and Tuari near Cortalim, Portuguese India (Kemp, 1917, 1918a), Middle Island, Andaman Archipelago (Kemp, 1917, 1918a), Telok Tikus, Penang (Kemp, 1917, 1918a), Bangkok, Siam (Suvatti, 1937), Chao Phya River at Bangsorn and Paknam, Siam (Suvatti, 1937), Bang-pa-kong River, Siam (Suvatti, 1937), Tale Sap, Singora, Siamese Malay States (Suvatti, 1937), Patani River near Patani, Siamese Malay States (Kemp, 1917, 1918a), Belawan, Sumatra (Gordon, 1935a). The present records from Java form an important enlargement of the range of distribution of the species.

Cryphiops Dana (1852)

The present genus differs from *Macrobrachium*, with which it often is united, by the absence of the hepatic spine on the carapace. In *Macrobrachium hildebrandti*, however, this spine sometimes

is absent too. On p. 3 1 I have already set forward my reasons for keeping *Cryphiops* and *Macrobrachium* as separate genera.

The type and only species of this genus is *Cryphiops spinuloso-manus* Dana. The species is better known under the name *Bithynis gaudichaudii* (H. Milne Edwards). Dana (1852a, b) described *Cryphiops spinuloso-manus* after a specimen in which the eyes, the antennae and antennulae were pressed under the carapace; he thought this probably artificial deformation to be a natural condition and considered the specimen to belong to a new genus and species. Dana's name *Cryphiops* is older than the name *Bithynis* Philippi (1860), and therefore has to be used.

Macrobrachium Bate, 1868

Cancer p.p. Linnaeus, 1758, Syst. Nat., ed. 10 vol. 1, p. 625.
Astacus p.p. Fabricius, 1775, Syst. Ent., p. 413.
Palaemon p.p. Fabricius, 1798, Suppl. Ent. Syst., pp. 378, 402.
Macrobrachium p.p. Bate, 1868, Proc. zool. Soc. Lond., 1868, p. 363.
Bithynis p.p. Bate, 1888, Rep. Voy. Challenger, Zool., vol. 24, p. 788.
Eupalaemon Ortmann, 1891, Zool. Jb. Syst., vol. 5, p. 696.
Brachycarpus p.p. Ortmann, 1891, Zool. Jb. Syst., vol. 5, p. 696.
Parapalaemon Ortmann, 1891, Zool. Jb. Syst., vol. 5, p. 696.
Macroterocheir Stebbing, 1908, Ann. S. Afr. Mus., vol. 6, p. 39.

Description. The body is compressed, generally it is robust, though in some species (e.g., *M. lanchesteri, M. jelskii, M. palaemonoides*) it is very slender. The rostrum is well developed, serrate and compressed; hairs are present between the teeth. The carapace in young specimens is smooth, in several species numerous small tubercles are present on the carapace of the adult specimens, being earlier visible in the males than in the females and being most distinct in the anterolateral parts of the carapace. Antennal and hepatic spines are present (the occasional lacking of the hepatic spine in specimens of species belonging to the present genus must be considered an abnormality). The antennal spine is placed slightly below the rounded orbital angle, the hepatic spine is situated slightly below and behind the antennal spine, being far removed from the anterior margin of the carapace in the adults (in the very young specimens of *M. australe* and *M. lar* (cf. pp. 130, 185) the hepatic spine is placed on the anterior margin of the carapace). A branchiostegal groove is present and visible as a sharp line (in very old specimens the groove sometimes has become rather indistinct), which runs from the anterior margin of the carapace straight to the hepatic spine, where it ends. Aberrant in this respect is *M. palaemonoides,* in which species the branchiostegal groove runs closely below the hepatic spine and continues a considerable distance behind it. This branchiostegal groove must not be confounded with the longitudinal groovelike depression, which is present in most species some distance below and behind the hepatic spine, this depression namely, is not indicated by a sharp line as is the branchiostegal groove.

The abdomen generally is smooth, at least in not full grown animals. In some species (e.g. *M. idae*) numerous small tubercles, similar to those on the carapace of those species, may be seen on the pleurae of the abdominal segments. The pleurae of the first three segments are broadly rounded, those of the fourth and fifth segments are narrower and tapering towards the apex, which is directed posteriorly. The top of the fourth segment always is broadly rounded, that of the fifth

sometimes ends in a minute sharp point. The pleurae of the sixth segment are very small and triangular, they end in a sharp posteriorly directed point. The posterolateral angle of the sixth segment ends in a sharp point, which overhangs the articulation with the telson. The telson is elongate triangular, narrowing posteriorly. Its dorsal surface is smooth or covered with numerous tubercles (e.g. in adult males of some species as *M. idae*). Two pairs of spines always are present on the dorsal surface of the telson. The anterior pair of these spines is placed in the middle of the telson, the posterior pair lies just midway between the anterior pair and the posterior margin of the telson. This posterior margin always ends in a sharp median point, which, however, in adult specimens often is much worn, so that it becomes truncate. The apex is flanked by two pair of spines, the outer of which generally are much shorter than the inner. The inner spines are slender and mostly overreach the apex of the telson (only in *M. rosenbergii, M. amazonicum,* and *M. panamense* these spines fail to reach the apex of the telson). Between the two inner spines several feathered setae are present, varying in number from 2 (e.g. in *M. amazonicum, M. mirabile,* and *M. palaemonoides*) to a very large number (in most species).

The eyes generally are well developed (only in *M. cavernicola* the cornea is strongly reduced in size). The cornea is globular and generally (with the exception of *M. cavernicola*) broader than the peduncle and pigmented. An ocellus always is present.

The antennular peduncle (fig. 23a) consists of three segments, the basal of which is broadest. In the proximal part of the outer margin it bears a slender stylocerite; the anterolateral angle of the segment is provided with a strong forwards directed spine, which overreaches distinctly the convex anterior margin of the segment. The second and third segments are much shorter and narrower than the first, mutually they are of about equal length and breadth. Of the two antennular flagella the lower is simple, the upper consists of two rami, which are fused in the basal part. This fused portion of the two rami consists of various joints: the first joint is largest, then follow 2-10 smaller joints, and finally there are 2-4 joints, which are separated by distinct grooves in their internal half, but are completely fused in their external half, where no trace of the grooves is visible. The shorter ramus of the flagellum consists of numerous joints, the number of which is due to considerable variation within the species.

The antenna has the scaphocerite well developed, it is twice to thrice as long as broad. The outer margin ends in a strong final tooth. The lamella has its anterior margin rounded or produced anteriorly or anterointernally, it generally overreaches the final tooth. The antennal peduncle fails to reach the middle of the scaphocerite. An external tooth always is present at the base of the antennal peduncle.

The mandible (fig. 23b) is distinctly cleft; the incisor process ends in three large blunt teeth, the molar process is provided with blunt knobs and ridges in its distal part. A large three-jointed palp is present (only in *M. cavernicola* the palp is stated to be two-jointed; in all species examined by me the palp is three-jointed). The maxillula (fig. 23c) has the inner lacinia slender, the upper lacinia is broadened and ends in several movable spines, the palp is distinctly bilobed. The maxilla (fig. 23d) has the endite deeply cleft, the palp is simple and well developed, the scaphognathite is large and rather slender. All maxillipedes are provided with well developed exopods. The basis and coxa of the first maxillipede (fig. 23e) are separated by a distinct notch, the palp is well developed and the exopod bears a distinct but not very broad caridean lobe; the epipod is bilobed, the upper lobe ends in

a rather acute point. The second maxillipede (fig. 23f) is more pediform, the last joint is fused with the penultimate along its entire length, the exopod reaches much beyond the endopod; the epipod bears a well developed podobranch. The third maxillipede (fig. 23g) is slender, it generally reaches with about the last joint beyond the antennal peduncle. This last joint measures about $^2/_3$ of the length of the penultimate and about half the length of the antepenultimate joint. The exopod is

Fig. 23. *Macrobrachium carcinus* (L.). a, antennula; b, mandible; c, maxillula; d, maxilla; e, first maxillipede; f, second maxillipede; g, third maxillipede. a, g, × 2.5; b-f, × 4.

well developed, an epipod is present, while furthermore an arthrobranch as well as a pleurobranch are attached to the base of the maxillipede.

The branchial formula is identical with that of the other Palaemoninae, it runs as follows:

	maxillipedes			pereiopods				
	I	II	III	I	II	III	IV	V
pleurobranchs	—	—	+	+	+	+	+	+
arthrobranchs	—	—	+	—	—	—	—	—
podobranchs	—	+	—	—	—	—	—	—
epipods	+	+	+	—	—	—	—	—
exopods	+	+	+	—	—	—	—	—

The first pereiopods are slender, the chela has the palm about as long as the fingers. No teeth are present on the cutting edges and no tubercles or spines on the rest of the surface, which, however, bears tufts of setae. At the lower surface of the palm and on the ventral surface of the distal part of the carpus groups of stiff setae are present, which together form an organ for cleaning purposes. The carpus is elongate, varying between being 1.5 to twice as long as the chela. The merus is somewhat shorter than the carpus. The shape of the second legs differs greatly in the various species of the present genus. The shape of the second leg is more robust than that of the other legs, and in adult males it often is larger than the entire body. The relation between the joints of the second legs is very different in the various species and in the various stages of one species. The legs may be covered with tubercles and spines or be entirely smooth. Often the right and left legs are equal in shape and size, but in some species there is a marked difference in the size and (or) the shape of these legs. The last three legs are equal in structure, the anterior generally being shorter and less slender than the posteriors. The dactylus is simple and generally provided with an anterior row of hairs. The propodus carries a posterior row of spinules, while in the fifth leg, just like in *Palaemon* there are transverse rows of setae or very fine and slender spinules present in the distal part of the posterior margin of the propodus. In some species the adult males have the various joints of the last three pereiopods closely beset with numerous small spinules.

The first pleopod has the endopod much smaller than the exopod, being still smaller in the female than in the male; in the male the endopod (fig. 24a) is ovate in shape, with the inner margin concave, no trace of an appendix interna is visible. The other pleopods have the endo- and exopods of about the same size, the endopod is provided with a slender appendix interna. In the male moreover, the endopod of the second pleopod (fig. 24b) bears a strong appendix masculina, which is placed between the appendix interna and the endopod, and which is longer and stronger than the appendix interna, it is provided with several stiff setae.

The uropods are ovate, they overreach the telson. The exopod has the outer margin slightly convex and ending in a tooth, which at its inner side bears a longer movable spine (only in *M. lamarrei* I could not detect this spine). The endopod is ovate, and unarmed.

Eggs. The ova have different sizes in the various species; some of the species carrying large eggs (1.0-2.0 mm in diameter) are *M. sintangense, M. pilimanus* and *M. trompii.* In many other species the eggs have a diameter of about 0.5 mm.

Ecology. The majority of the species of the present genus inhabits fresh waters of tropical regions. Some species (e.g. *M. rosenbergii* and *M. equidens*) often are found in brackish water and even may go into the sea. Of several others the localities mentioned in literature are too vague or not trustworthy enough to make it certain that they really occur in sea. Of several species the young hatch in or near the sea, which probably will account for the fact that several of these freshwater species have such a large range of distribution.

Geographic distribution of the indo-westpacific species. A number of species of *Macrobrachium* has a large range of distribution, some for instance are known from E. Africa or India to Polynesia (*M. australe, M. aemulum* and *M. lar*), others range from E. Africa or India to the Malay Archipelago (*M. idae, M. equidens, M. mirabile, M. rosenbergii, M. hirtimanus,* and *M. scabriculum*), *M. rude* and *M. idella* occur in E. Africa and India, *M. hainanense* in China and the Malay Archipelago, while *M. latimanus* is known from W. Sumatra eastwards to the Marquesas. Most other indo-westpacific

species are confined to a smaller area. So *M. lepidactylus*, *M. petersii*, *M. patsa*, *M. hildebrandti*, *M. petiti*, *M. niloticum* and *M. moorei* are only known from E. Africa (including Madagascar), *M. lamarrei*, *M. malcolmsonii*, *M. naso*, *M. altifrons*, *M. cavernicola*, *M. hendersoni* and *M. dayanum* from India and Burma. Restricted to the Chinese area (including S. Siberia, Japan and Formosa) are 9 species: *M. superbum*, *M. venustum*, *M. formosense*, *M. nipponense*, *M. japonicum*, *M. insulare*, *M. asperulum*, *M. kiukianense*, and *M. yui*. The Malay Archipelago (including the Malay Peninsula, the Philippines and New Guinea) possesses the following 27 endemic species: *M. weberi*, *M. latidactylus*, *M. minutum*, *M. mammillodactylus*, *M. sintangense*, *M. lanceifrons*, *M. oenone*, *M. coulesi*,

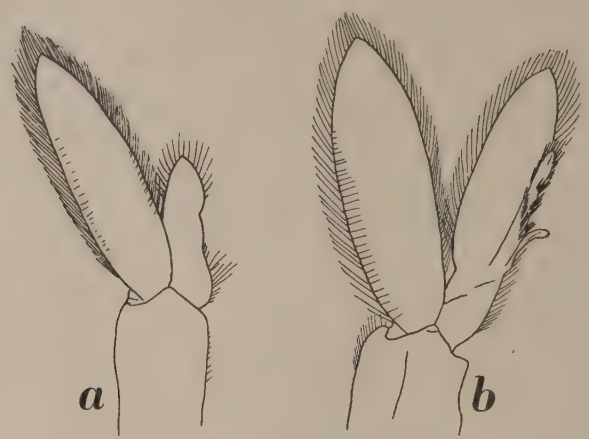

Fig. 24. *Macrobrachium carcinus* (L.). a, first pleopod of male; b, second pleopod of male. a, b, × 3.

M. esculentum, *M. geron*, *M. joppae*, *M. palaemonoides*, *M. bariense*, *M. placidum*, *M. placidulum*, *M. lorentzi*, *M. pilimanus*, *M. sulcicarpale*, *M. jacobsoni*, *M. trompii*, *M. clymene*, *M. sophronicum*, *M. horstii*, *M. jaroensis*, *M. callirhoë*, *M. javanicum*, and *M. lanchesteri*. From Australia two endemic species are known: *M. australiense* and *M. novae-hollandiae* (the latter, however, also has been reported from New Caledonia). From Oceania only two endemic species are known, namely *M. caledonicum* from New Caledonia and *M. grandimanus* from the Hawaiian Archipelago.

From the 67 species of *Macrobrachium* at present known with certainty from the indo-west-pacific region not less than 37 occur in the Malay Archipelago. From the region east of the Malay Archipelago only 9 species are known, from the region north of the Archipelago 11 species, and from the region west of the Archipelago 25 species. From the distribution of the species in the Malay Archipelago still too little is known to make it possible to draw zoogeographic conclusions, only the close relation between Sumatra, Borneo, Java and the Malay Peninsula is distinctly shown by the distribution of *M. sintangense*, *M. pilimanus*, *M. trompii* and *M. javanicum*.

The difficulty of the study of the genus *Macrobrachium* is largely due to two factors, these are:

1. Most species of *Macrobrachium* resemble each other in so many respects that only a very restricted number of organs are providing characters for the separation of the species (the most important of these organs are the rostrum and the second pereiopods).

2. The large variability of the various characters, which are used for the specific separation of the members of the genus. Apart from individual variability, which often is considerable, the

specimens of one and the same species often show large differences which are only due to age or sex:
A. Differences due to age.

The first differences due to age of course are shown in the embryonic and larval development. Our knowledge of these developments in the present genus is very poor. For literature on this subject I refer to Gurney (1939, pp. 78, 79). It will not be dealt with here.

The postlarval stages of three species (*M. australe, M. latimanus* and *M. lar*) are treated in the present paper (cf. respectively pp. 130, 208, and 185). They agree well with the description given by Müller (1880) [1]) of young stages of *Macrobrachium potiuna.* These postlarval specimens may be distinguished from older forms by having the carapace provided with a supraorbital tubercle at each side, this tubercle probably is the last vestige of the supraorbital spine of the larva. Further the hepatic spine is placed on the anterior margin of the carapace, in older stages this spine gradually moves backwards. The mandibular palp consists of only one bud-like joint. The last three pereiopods have the dactylus biunguiculate. Whether these features are present in all species of *Macrobrachium,* or only in the forms mentioned above, I could not make out by lack of material.

Young (not larval or postlarval) specimens of *Macrobrachium* species differ from older in the following points:

1. The size is smaller and the body is more slender.
2. The rostrum is relatively longer and more slender.
3. The carapace and the abdomen are always smooth and shining.
4. The sixth abdominal segment is much more elongate.
5. The tip of the telson always ends in a sharp median point.
6. The second pereiopods are equal, smooth, slender, and distinctly shorter than the body. The toothing of the cutting edges of the fingers is not or only indistinctly visible. Also the relation between the various joints of the second leg in the young specimens is different from that in the adults, as the various joints do not grow with the same rapidity. Henderson & Matthai (1910, p. 278) gave the following rules for the relation between the rapidity of the growth of the joints of the second leg:

a. The ischium grows more slowly than the merus.
b. The merus and the carpus grow with the same rapidity.
c. The palm grows faster than the carpus.
d. The fingers grow less rapidly than the palm and slightly faster than the merus and the carpus.

These rules generally are confirmed by my material, though exceptions are found. So for instance in *M. idae* and *M. weberi* the carpus grows faster than the chela, a feature which is thought by Ortmann (1891, pp. 694, 695) to be impossible in the present genus: "Andererseits kann ein Carpus, der schon in der Jugend kürzer ist als die Scheere, niemals im Alter die Länge der letzteren erreichen oder gar übertreffen."

B. Differences due to sex.

The differences between full grown males and females generally are very large, especially with regard to the shape of the second legs. These differences are:

1. The carapace and abdomen of the female generally are smooth (they seldom are rugose in very old females of some species), while in several species the full grown males have the carapace and sometimes also the abdomen covered with numerous small closely packed tubercles.

1) Müller's 1892 paper could not be examined by me.

2. In most species the full grown males have the second legs enormously developed, being much longer than the body, sometimes the left and right leg are conspicuously different in shape. In the females these legs are much shorter and much more slender than in the males and furthermore equal in shape. The relation between the lengths of the various joints of the second legs in the female shows much resemblance to that of young males and differs from that of the adult male. The spinulation of the female leg also is less strong than that of the male.

3. The last three legs in the males of some species are granulated, while these granules are absent or at least very indistinct in the females.

Concluding we may remark that the females most resemble not full grown males.

I intentionally have used here the word "full grown" instead of "adult", as of a large number of species of *Macrobrachium* it is known that they reach sexual maturity long before attaining their final size and shape. So for instance often males are found, which still show the characters of not full grown specimens (resembling thereby the females) but which nevertheless are sexually mature. Such males have been named by Coutière (1901, p. 209) "mâles féminisés". Henderson & Matthai (1910) examined such "mâles féminisés" and found them sexually mature, with free spermatozoa in the vasa deferentia. In full grown males, it is true, the testes were proportionally larger and the vasa deferentia more coiled. Even in very small males free spermatozoa were found. Also the females of some species may be sexually mature long before the full size is reached. So for instance in *M. pilimanus* ovigerous females generally are about 40 mm in length, but instances are known in which specimens of 16 mm are provided with eggs. In my opinion we may not speak here of dimorphism, but must consider the "mâles féminisés" to be sexually mature but not yet fully developed males. In all probability these males afterwards will attain the shape of the full grown males.

Still more difficult than defining the species of the present genus is to divide the genus into subgenera. This for the first time was attempted by Ortmann (1891) who divided the genus into four subgenera: *Eupalaemon, Parapalaemon, Macrobrachium* and *Brachycarpus,* which are characterized by the cylindrical or flat palm of the second leg and by the relation in length between the carpus and merus. As already pointed out by Henderson & Matthai (1910) and as is also found by myself in my material, this subdivision of the genus is untenable as the characters used by Ortmann are not sufficient to divide the genus into sharply defined groups. So Henderson & Matthai give the example of *Macrobrachium asperulum,* of which species the young specimens according to Ortmann's division should have to be placed in the subgenus *Eupalaemon,* older specimens in *Parapalaemon* and fullgrown males in *Macrobrachium.* There are of course several natural groups in the present genus, but still too little is known of the various forms to make a sharp and useful separation into subgenera of the genus *Macrobrachium* possible. Therefore in the present paper the genus *Macrobrachium* is considered as a unity and no splitting of it into subgenera is tried, as this only will lead to confusion.

In the following key it is attempted to distinguish all kown indo-westpacific species of *Macrobrachium,* the species incertae excluded. The characters for the larger part are based on fullgrown males, as the females and young males generally provide no characters which may be used in a key. Some reserve is needed with the use of this key, as some of the species said to be described in literature after full grown males in reality are described after young males or "mâles féminisés", so that th

characters used here to distinguish them from other species may prove to be due only to the age of the specimens. There can not be laid too much stress on the fact that it generally is next to worthless to describe new species after material in which no full grown male is represented.

The key is followed by a more extensive account of all the species mentioned in it.

Key to the indo-westpacific species of the genus *Macrobrachium* [1])

1.	Carpus distinctly longer than the merus.	2
—	Carpus about as long as or shorter than the merus	28
2.	Rostrum with a distinct elevated basal crest, generally very long or with a distinct naked portion in the distal half of the upper margin	3
—	Rostrum without a distinct elevated basal crest	6
3.	Lower margin of rostrum with 8-14 teeth. Rostrum long and curved upwards. Tip of telson reaching beyond the tip of the longer posterior spines	*rosenbergii*
—	Lower margin of rostrum with 4-7 teeth. Rostrum generally straight. The distal part of the rostrum bears no dorsal teeth. Tip of the telson overreached by the longer posterior spines	4
4.	Basal crest not much elevated, provided with 5-9 teeth. Small species (up to 60 mm in length). Palm not swollen, fingers shorter than palm	*lamarrei*
—	Basal crest distinctly elevated, provided with 9-12 teeth. Large species (up to 230 mm in length). In young specimens of about 60 mm the second leg has the palm swollen and the fingers longer than the palm	5
5.	Carpus in adult males shorter than the chela	*malcolmsonii*
—	Carpus in adult males longer than the chela	*weberi*
6.	Fingers of the large chela of the adult male with numerous teeth placed on the cutting edges	7
—	Fingers of the large chela of the adult male at most with 1 or 2 teeth in the proximal part of the cutting edges, the rest of the cutting edge entire. . .	9
7.	4-6 teeth of the upper margin of the rostrum behind the orbit. Second chelae of the large male very unequal. Large chela with the palm strongly compressed	*latidactylus*
—	2 or 3 teeth of the upper margin of the rostrum behind the orbit. Second chelae of the adult male more or less cylindrical	8
8.	Rostrum directed straight forwards, teeth evenly dispersed over the dorsal margin of the rostrum. The palm of the second leg of the adult male slightly compressed. The fingers of the second legs in the adult male with 6-10 denticles, fingers about as long as the palm	*caledonicum*
—	Rostrum with the tip directed upwards. The ultimate tooth of the upper margin of the rostrum generally separated from the penultimate by an interspace, which is larger than that between the other teeth. Palm of the second leg of the adult male cylindrical, the fingers generally with more than 10 denticles on the cutting edges and distinctly shorter than the palm	*australe*
9.	4-6 teeth of the dorsal margin of the rostrum behind the orbit.	*aemulum*
—	2 or 3 teeth of the dorsal margin of the rostrum behind the orbit	10

1) See also the addendum at the end of this paper.

10. Second leg of adult male smooth, without tubercles; fingers of this leg without or with 1 or 2 microscopical small denticles in the proximal part of the cutting edges 11
— Second leg of adult male with many distinct tubercles; fingers of this leg with 1 or 2 distinct proximal teeth on the cutting edges 15
11. Rostrum distinctly longer than the scaphocerite, lower margin with 5-8 teeth 12
— Rostrum as long as or shorter than the scaphocerite, lower margin with 2-4 teeth 14
12. Carpus of the second leg of the adult male shorter than the cheia . . . . . *naso*
— Carpus of the second leg of the adult male much longer than the chela . . 13
13. Rostrum straight. Last three pereiopods of about equal length. Fifth leg reaching with dactylus only beyond scaphocerite . . . . . *lamarrei*
— Rostrum distinctly curved upwards at the apex. Fourth and fifth leg conspicuously longer than the third. Fifth leg reaching with the larger part of the propodus beyond the scaphocerite . . . . . *palaemonoides*
14. Upper margin of rostrum with 5-9 teeth . . . . . *lanchesteri*
— Upper margin of rostrum with 13-15 teeth . . . . . *superbum*
15. Carpus of the second leg of adult males longer than the chela 16
— Carpus of second leg in adult males shorter than the chela 18
16. Small species up to about 40 mm in length. Chela of second leg in adult male with tubercles along each side of the cutting edge . . . . . *minutum*
— Larger species. Chela of second leg in the adult male without tubercles at each side of the cutting edges 17
17. Rostrum with 9 to 11 dorsal teeth, 3 of which generally are placed behind the orbit . . . . . *idae*
— Rostrum with 12 to 15 dorsal teeth, 2 of which generally are placed behind the orbit . . . . . *idella*
18. Large chela of adult male with tubercles at both sides of the cutting edge of the dactylus 19
— Fingers of the large chela of the adult male without a row of tubercles along each side of the cutting edge 23
19. Fingers of large chela of adult male naked or with some few scattered setae . *mammillodactylus*
— Fingers of large chela (at least the dactylus) of the adult male at least in their basal half provided with numerous long hairs, which form a velvety coat . . 20
20. All joints of the second legs of the adult male pubescent . . . . . *rude*
— Only the fingers of the second legs of the adult male pubescent 21
21. Dactylus of large chela of adult males measuring more than $^3/_4$ of the length of the palm. Velvety covering of hairs of the mobile finger of the large chela of adult male reaching as far forwards as that of the fixed finger; more than $^1/_3$ of the mobile finger remaining naked. Second legs of the adult male equal in size. Eggs large, 1.0-1.5 mm in diameter . . . . . *sintangense*
— Dactylus of large chela of adult male measuring less than $^3/_4$ of the length of the palm. Velvety coat of hairs of the mobile finger of the large chela of the

adult male reaching much farther forwards than that of the fixed finger; the velvety hairs of the mobile finger reaching almost the apex. Second legs unequal in size in the adult male. Eggs small, being 0.5-1.0 mm in diameter . . . . *lanceifrons* 22

22. Rostrum in old specimens curved slightly upwards at the top. Rostral formula $\frac{10-13}{3-5}$ . . . . . *lanceifrons lanceifrons*

— Rostrum straight. Rostral formula $\frac{8-10}{2-3}$ . . . . . *lanceifrons montalbanense*

23. Chelae of the second legs in adult males naked or with a row of short hairs at each side of the cutting edge only 24

— Chelae of the second legs in adult males with the fingers covered with stiff or velvety hairs on the entire surface or in the proximal part only 27

24. Lower margin of the rostrum with 5 teeth . . . . . *novae-hollandiae*

— Lower margin of rostrum with 2 or 3 teeth 25

25. Rostrum with upper margin provided with 7-9 teeth. Fingers of large chela of adult male very high (and compressed ?) . . . . . *venustum*

— Rostrum with upper margin provided with 10-15 teeth. Fingers of large chela of adult male slender and cylindrical 26

26. Fingers of large chela of adult male half as long as the palm or shorter. Carpus as well as palm of that leg slender, at least 9 times as long as broad *formosense*

— Fingers of large chela of adult male half as long as the palm or longer. Carpus as well as palm of that leg more robust, less than 7 times as long as broad . . *hainanense*

27. Lower margin of rostrum with 5-7 (seldom 4) teeth. Rostrum generally distinctly curved upwards . . . . . *equidens*

— Lower margin of rostrum with 2 or 3 teeth. Rostrum straight . . . . . *nipponense*

28. Fifth legs conspicuously (about $^4/_3$) longer than the fourth. Rostrum short and high, with many dorsal teeth. Second legs of adult male smooth . . . . . *mirabile*

— Fifth legs of about the same length as the fourth 29

29. Second chelae of the adult male equal or subequal in shape. Fingers of the smaller leg closing, not provided with stiff and long inwards directed hairs along the cutting edges. Fingers of the smaller leg usually shorter than the palm 30

— Second chelae of the adult male very unequal in shape. Fingers of the smaller leg usually gaping, longer than the palm and provided with long and stiff inwards directed setae along the cutting edges 59

30. Fingers of the second legs of the adult males with one or two (seldom without) fairly large teeth; sometimes there are some smaller teeth present between the first tooth and the base of the finger, but never between the last large tooth and the apex of the finger 31

— Fingers of second legs of the adult male with numerous (more than 4) teeth, which are placed at regular intervals; sometimes these teeth are placed in the proximal part of the cutting edge of the fingers only. The teeth generally are of equal size, if, however, one is larger, than this always is one of the proximal teeth 51

31. Carpus about as long as merus, more or less elongate 32
— Carpus distinctly shorter than merus, more or less triangular in longitudinal section 48
32. Fingers of large chela of adult male entirely covered with a thick clothing of velvety hairs . . . . . *australiense*
— Fingers naked or at most with some short hairs along the cutting edges only 33
33. Chelae of adult male smooth, without tubercles or spines . . . . . *hildebrandti*
— Chelae of adult male distinctly tuberculate 34
34. Two or three teeth of the upper margin of the rostrum behind the orbit . . 35
— Four or more teeth of the upper margin of the rostrum behind the orbit . . 44
35. Rostrum short and blunt, not reaching beyond the second segment of the antennular peduncle . . . . . *insulare*
— Rostrum generally slender, reaching to or beyond the end of the antennular peduncle 36
36. Chelae of the adult males without longitudinal grooves or carinae on the fingers 37
— Second chelae of adult males with distinct longitudinal grooves or carinae on both lateral surfaces of the fingers 43
37. Carpus of the second legs of adult males distinctly shorter than the palm . . 38
— Carpus of the second legs of adult males as long as or longer than the palm . . 41
38. Upper margin of rostrum with 7 or 8 teeth . . . . . *lar*
— Upper margin of rostrum with 10 to 13, seldom 9 teeth 39
39. Teeth on the cutting edges of the fingers of the second chela of the adult male large, the anterior tooth of the dactylus placed in or slightly before the middle of the finger. . . . . *javanicum*
— Teeth on the cutting edges of the fingers of the second chela of the adult male very small and placed in the proximal third of the fingers 40
40. Rostrum rather slender, reaching beyond antennular peduncle . . . . . *asperulum*
— Rostrum short and high, not reaching beyond antennular peduncle . . . . *altifrons*
41. Upper margin of rostrum with 7 or 8 teeth. Fingers of second leg of adult male distinctly shorter than the palm. China . . . . . *kiukianense*
— Upper margin of the rostrum with 9-13 teeth. Fingers of second leg of adult male as long as or distinctly longer than the palm. Africa 42
42. One of the dorsal rostral teeth is placed behind the orbit. A distinct naked space is present between the last dorsal tooth and the tip of the rostrum. Lower margin of the rostrum with 1 or 2 teeth . . . . . *niloticum*
— Two or three dorsal rostral teeth are placed behind the orbit. Rostral teeth divided regularly over the upper margin. Lower margin of the rostrum with 3-5 teeth . . . . . *moorei*
43. Rostrum curved upwards, generally with a naked space behind the two or three subapical teeth. 5 or 6 lower teeth on the rostrum. Fingers of second leg of adult male with setose grooves . . . . . *dayanum*
— Rostrum directed slightly downwards, upper teeth divided regularly over the dorsal margin of the rostrum. Lower margin of the rostrum with 2 or 3 teeth.

Fingers of the second legs of the adult male with a longitudinal carina at each side. . . . . *callirhoë*

44. Lower margin of rostrum with 4 or 5 teeth . . . . . *petiti*
— Lower margin of rostrum with 2 or 3 teeth 45
45. Rostrum very narrow, first tooth of lower margin placed anteriorly of the antepenultimate dorsal tooth . . . . . *sophronicum*
— Rostrum rather broad, lamelliform. First tooth of lower rostral margin placed posterior of the antepenultimate dorsal tooth. 46
46. Distal part of the cutting edge of the fingers of the second legs in the adult male without a row of tubercles at both sides . . . . . *japonicum*
— A row of blunt tubercles is placed at each side of the distal part of the cutting edge of the fingers of the second leg in the adult male. The outer of these rows often is placed so close to the edge, that it seems to be placed on it 47
47. Fingers of both second chelae of the adult male distinctly shorter (about $^3/_4$) than the palm. No thick row of short hairs along the cutting edges of the fingers. *horstii*
— Fingers of the smaller second leg of adult male longer than, those of the larger leg as long as the palm. A thick row of hairs along the cutting edge of both fingers . . . . . *jaroense*
48. Mandibular palp two-jointed. Eyes with the cornea strongly reduced, being much narrower than the eyestalk . . . . . *cavernicola*
— Mandibular palp three-jointed. Eyes with the cornea well developed, distinctly broader than the eyestalk 49
49. Both dactylus and fixed finger of large chela of the adult male with only 1 or 2 large teeth on the cutting edge 50
— Behind the 1 or 2 large teeth of the cutting edges of the fingers of the large chela of the adult male several smaller teeth are present, which, however, sometimes almost obtain the size of the larger teeth. . . . . *latimanus*
50. The fingers of the large chela of the adult male with numerous longitudinal grooves, which are filled with closely packed hairs. Tubercles on the large second pereiopod of the adult male small and inconspicuous . . . . . *hendersoni*
— Fingers of the large chela of the adult male without grooves and hairs. Tubercles on the second leg of the adult male very strong . . . . . *clymene*
51. Large chela of adult male naked or with some scattered hairs. 52
— Large chela of adult male with numerous feltlike or woolly hairs on the palm or fingers or on both 53
52. Carpus of second chela of adult male longer than the palm . . . . . *patsa*
— Carpus of second chela of adult male shorter than the palm . . . . . *yui*
53. Palm of large chela of adult male for the larger part naked or with some scattered hairs only (sometimes the extreme distal part of the palm is pubescent). The hairs on the fingers numerous and placed close together, woolly 54
— Palm or large chela of adult male entirely covered with velvety hairs (sometimes the extreme distal part is naked). Fingers naked or velvety pubescent . . 55

54. Upper margin of the rostrum straight. Rostrum with 10 to 12 dorsal and 4 to 6 ventral teeth. Hepatic and antennal spine situated in one line . . . . . *trompii*
— Upper margin of rostrum distinctly convex. Rostrum with 12 to 14 dorsal and 2 to 4 ventral teeth. Hepatic and antennal spine not situated in one line . . . *lorentzi*
55. Fingers of large chela of adult male entirely covered with velvety hairs. Carpus of second legs of adult male conical, usually much shorter than the merus. . *pilimanus*
— Fingers of large chela of adult male partly or entirely naked. Carpus of second legs of adult male generally of the same length as the merus . . . 56
56. Carpus of second legs of adult male with 2 distinct longitudinal grooves . . *sulcicarpale*
— Carpus of second legs without longitudinal grooves 57
57. Palm of large chela of adult male, sometimes also the basal part of the fingers, velvety pubescent. Carpus, merus and ischium without this pubescence . . . 58
— Palm of large chela, as well as carpus, merus and ischium of both second legs of the adult male provided with a thick coat of velvety hairs; only the fingers and a small distal portion of the palm naked . . . . . *petersii*
58. Fingers of the large chela of the adult male with a velvety pubescence in their basal portion. Dorsal teeth of the rostrum beginning in the distal third of the carapace . . . . . *scabriculum*
— Fingers and distal part of the palm of the large chela of the adult male entirely naked. Dorsal teeth of the rostrum beginning in the middle of the carapace . . . . . *jacobsoni*
59. Carpus of large chela of adult male about as long as the merus 60
— Carpus of large chela of adult male distinctly shorter than the merus . . 67
60. Palm of large chela of adult male with many closely packed long hairs near the base 61
— Palm of the large chela of the adult male naked or with some scattered short hairs 62
61. Palm of larger leg of adult male rather short and high, not more than 2.5 times as long as broad, distinctly broader proximally than distally. Distal large tooth of the dactylus placed some distance anterior of the distal large tooth of the fixed finger; gap between the large teeth of the fingers thereby not sharply defined . . . . . *grandimanus*
— Palm of larger leg of adult male slender, more than thrice as long as broad, of about the same breadth throughout its length. The distal large tooth of the dactylus placed just opposite of the distal large tooth of the fixed finger. A distinct gap is present behind these large teeth . . . . . *joppae*
62. Fingers of smaller second leg of adult male much (1.5 times to twice) longer than the palm 63
— Fingers of smaller second leg of adult male much shorter than to about as long as the palm 66
63. Rostrum rather high, teeth slender, directed forwards. Large chela of adult male with small conical tubercles. Last three pereiopods of adult male with some scattered hairs, but without scale-like tubercles 64

— Rostrum narrow, with the teeth broad and erect. Large chela of adult male as well as the last three pereiopods covered with numerous scale-like tubercles . 65

64. Merus always somewhat longer than the carpus. Fingers of the large chela in the adult male closing over their entire length . . . . . *bariense*

— Merus always somewhat shorter than the carpus (often, especially in adult males, the difference is considerable). Fingers of the large chela in the adult male strongly curved and gaping . . . . . *latidactylus*

65. Upper margin of rostrum with 11 to 14 teeth, the first of which is placed in the anterior third of the carapace. Tip of the rostrum generally reaching to the end of the antennular peduncle. Carpus of the large chela of the adult male generally somewhat shorter than the merus . . . . . *lepidactylus*

— Upper margin of the rostrum with 10 to 13 teeth, the first of which is placed slightly before the middle of the carapace. Tip of the rostrum seldom reaching beyond the end of the second segment of the antennular peduncle. Carpus of the large chela of the adult male generally somewhat longer than the merus *hirtimanus*

66. Fingers of the large chela of the adult male as long as the palm or longer. Carpus of this leg somewhat longer than the merus . . . . . *placidum*

— Fingers of the large chela of the adult male $^2/_3$ as long as the palm or shorter. Carpus of this leg somewhat shorter than the merus . . . . . *placidulum*

67. Large chela of the adult male with the palm naked or with a few scattered hairs only. . . . . *oenone*

— Large chela of adult male with the palm entirely or partly covered with a thick coat of woolly hairs 68

68. Palm of large chela of adult male with two distinct patches of closely packed woolly hairs near the base, rest of the palm naked . . . . . *cowlesi*

— Palm or large chela of adult male entirely covered with woolly hairs 69

69. Cutting edge of the fingers of the large chela of the adult male with numerous small teeth regularly divided over its entire length . . . . . *esculentum*

— Cutting edge of the fingers of the large chela of the adult male, apart from some inconspicuous denticles near the base, only with two large teeth . . . *geron*

Macrobrachium rosenbergii (De Man) (fig. 25)

Locusta Marina Rumphius, 1705, Amboin. Rariteitkam., ed. 1, p. 3, pl. 1 fig. B.
Locusta Marina Indica Rumphius, 1711, Thesaurus Imag., ed. 1, p. 1, pl. 1 fig. B.
Locusta Marina Indica Rumphius, 1739, Thesaurus Imag., ed. 2, p. 1, pl. 1 fig. B.
Locusta Marina Rumphius, 1740, Amboin. Rariteitkam., ed. 2, p. 3, pl. 1 fig. B.
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Siboga Expedition

Station 82, Batupangal, Mahakam River, E. Borneo; June 15 and 16, 1899. — 32 specimens 71-275 mm (including 2 ovigerous females).

Museum Leiden

Siam; 1877; leg. Winckel. — 2 specimens 217 and 227 mm.
We Island, off northpoint of Sumatra; 1910 and January, 1913; leg. P. Buitendijk. — 2 specimens 122 and 180 mm.
Java Sea; May, 1911 and October, 1911; leg. P. Buitendijk. — 7 specimens 95-275 mm (incl. 1 ovig. female).
Batavia; leg. P. Bleeker. — 3 specimens 196 and 246 mm.
Batavia; 1896; leg. A. G. Vorderman. — 1 specimen 228 mm.
Tandjong Priok near Batavia; 1907, and November, 1927; leg. P. Buitendijk. — 4 specimens (1 ovigerous female) 101-165 mm.
Bay of Batavia; August, 1908; leg. P. Buitendijk. — 3 specimens (1 ovigerous female) 72-161 mm.
Tjiliwong near Batavia; 1904; leg. P. Buitendijk. — 2 specimens (1 ovigerous female) 182 and 210 mm.
N. W. coast of Java near Tjiliwong; 1906; leg. P. Buitendijk. — 3 specimens 75-190 mm.
Tjilatjap, south coast of Java; August, 1905; leg. P. Buitendijk. — 1 specimen 158 mm.
Off Semarang, northcoast of Central Java; December, 1910; leg. P. Buitendijk. — 2 specimens (1 ovigerous female) 131 and 210 mm.
Surabaja, E. Java and Menado, N. Celebes. — 14 specimens 62-230 mm.
Besuki, north coast of E. Java; leg. J. Semmelink. — 1 specimen 154 mm.
Java; leg. P. Bleeker. — 3 specimens 82-180 mm.
Java; leg. H. Kuhl and J. C. van Hasselt. — 1 specimen 154 mm.
Pontianak, S. W. Borneo;1894; leg. A. W. Nieuwenhuis. — 2 specimens 128 and 136 mm.
Pelaihari, near Bandjermasin, S. E. Borneo; 1886; leg. J. Semmelink. — 2 specimens.
Tepuh, Upper Mahakam River, E. Borneo; November, 1897; leg. A. W. Nieuwenhuis. — 1 specimen 220 mm.
Borneo; leg. C. A. L. M. Schwaner. — 1 specimen 110 mm.

Makassar, S. W. Celebes; 1861; leg. Groen. — 11 specimens 141-206 mm (included ovigerous females)
Makassar; leg. D. M. Piller. — 4 specimens 105-130 mm.
Andai, near N. W. New Guinea; leg. C. B. H. von Rosenberg; type. — 1 ovigerous female 250 mm.
Korime River near Nimboran, North New Guinea; September, 1910; New Guinea Expedition, 1910-1911. — 1 specimen 206 mm.
Malay Archipelago. — 8 specimens 64-146 mm.
? New Ireland; 1855; coll. Frank. — 4 specimens 110-245 mm (dry).
? West Indies; coll. Frank. — 1 ovigerous female 176 mm.
Locality unknown; don. J. Moll. — 3 specimens 136-291 mm.
Locality unknown; don. Rotterdam Zoological Gardens. — 2 specimens 248 and 264 mm.
Locality unknown. — 8 specimens 131-260 mm.

Museum Amsterdam

Calcutta; leg. M. Weber. — 2 specimens 233 and 250 mm.
Deli, N. E. Sumatra; leg. L. P. de Bussy. — 12 specimens (5 ovigerous females) 153-288 mm.
Sungai Suka, N. E. Sumatra; fresh water; May 19, 1919; leg. F. C. van Heurn. — 3 specimens 234-275 mm.
Taluk, Indragiri River, Central Sumatra; leg. J. P. Kleiweg de Zwaan. — 2 specimens 203 and 302 mm.
Djambi, E. Sumatra; leg P. E. Moolenburgh. — 17 specimens (included ovigerous females) 122-274 mm.
Palembang, E. Sumatra; 1909; leg. Salm. — 6 specimens (1 ovigerous female) 137-226 mm.
Java. — 4 specimens (1 ovigerous female) 164-183 mm.
Pajeti, Sumba. — 1 specimen 86 mm.
Riko near Balikpapan, E. Borneo; fresh water; leg. W. J. Tissot van Patot. — 1 specimen 270 mm.
Balikpapan, E. Borneo; bay and river; leg. W. J. Tissot van Patot. — 7 specimens 82-202 mm.
Makassar, S. W. Celebes; captured in sea; 1888-1889; leg. M. Weber. — 3 specimens 81-114 mm.
Wai La, Waigeo, near N. W. New Guinea; January 18, 1910; leg. L. F. de Beaufort. — 2 specimens (1 ovigerous female) 236 and 306 mm.
Waiu Waigee River, W. Waigeo; leg. L. F. de Beaufort. — 1 ovigerous female 230 mm.
Kloof Bivouac, upper Lorentz (= Noord) River, S. W. New Guinea; leg. G. M. Versteeg; S. New Guinea Expedition, 1912. — 8 specimens 107-203 mm.
Kloof Bivouac, upper Lorentz River; January 1913; leg. G. M. Versteeg; S. New Guinea Expedition, 1912. — 3 specimens 115-270 mm.
Alkmaar, upper Lorentz River, S. W. New Guinea; August 8, 1907, September 20 and October 24, 1909; leg. H. A. Lorentz; New Guinea Expeditions, 1907 and 1909. — 9 specimens 131-257 mm.
Alkmaar camp, upper Lorentz River, S. W. New Guinea; left behind by the Exploration detachment. — 5 specimens 120-231 mm.
Sabang, Sago marsh, upper Lorentz River; July 12 and 15, 1907; New Guinea Expedition, 1907. — 5 specimens 85-298 mm.
Rivier camp, near Sabang, upper Lorentz River; February 10-12, 1910; leg. H. A. Lorentz; New Guinea Expedition 1909. — 5 specimens (1 ovigerous female) 137-252 mm.
Regen Island, upper Lorentz River; September 30, October 1 and 2, 1909; New Guinea Expedition, 1909. — 3 specimens (1 ovigerous female) 183-186 mm.
Pandanus creek, Lorentz River, S. W. New Guinea; September 17 and 18, 1909; leg. H. A. Lorentz; New Guinea Expedition, 1909. — 5 specimens 130-200 mm.
Bivak Island, Lorentz River; September 14, 1909; leg. H. A. Lorentz; New Guinea Expedition, 1909. — 1 specimen 116 mm (bopyrized).
Van der Sande (= Bibis) River, tributary of Lorentz River; September 10, 1909; leg. H. A. Lorentz; New Guinea Expedition, 1909. — 1 specimen 162 mm.
Lorentz River, S. W. New Guinea; May 7-9, 13, 15-19, 1907, September 5, 12, 14-16, 23, 1909; leg.

H. A. Lorentz; New Guinea Expeditions, 1907 and 1909. — 23 specimens (3 ovigerous females) 54-200 mm (2 specimens bopyrized).

Creek near Lorentz River, S. W. New Guinea; May 14 and July 6, 1907; leg. H. A. Lorentz; New Guinea Expedition, 1907. — 4 specimens 60-127 mm.

Merauke, S. W. New Guinea; 1905; leg. J. W. R. Koch; New Guinea Expedition, 1904-1905. — 1 specimen about 190 mm (damaged).

S. W. New Guinea; 1912; leg. G. M. Versteeg; New Guinea Expedition, 1912. — 3 specimens 123-233 mm.

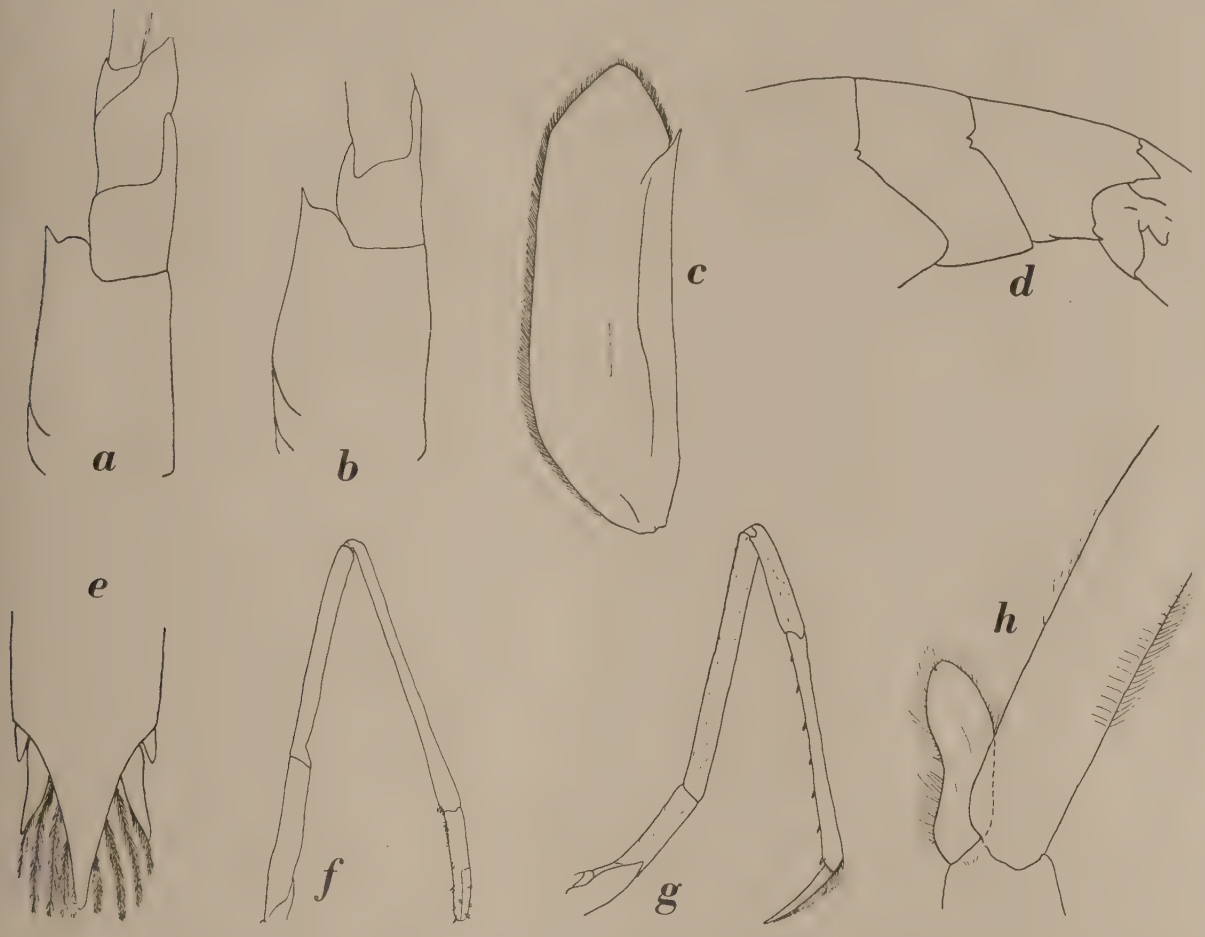

Fig. 25. *Macrobrachium rosenbergii* (De Man). a, b, antennular peduncles; c, scaphocerite; d, abdomen in lateral view; e, tip of telson; f, first pereiopod; g, third pereiopod; h, first pleopod of male. a, b, d, × 2.6; c, f, g, × 2.3; e, × 27; h, × 4.6.

Indonesia; coll. J. G. de Man. — 1 ovigerous female 153 mm.

East Asia. — 1 specimen 253 mm.

Locality unknown. — 5 specimens (1 ovigerous female) 173-273 mm.

This well known and widely distributed species has already extensively been described by Cowles (1915). In my material the same variation in the length of the rostrum is shown as in Cowles's material; the curvature of the rostrum in my specimens is rather variable, it generally follows the rule given by Cowles that in older specimens the rostrum is less curved than in the younger, but there are exceptions to this rule.

The antennula (figs. 25a, b) is of the normal shape. The free portion of the upper flagellum is variable in length and may consist of more than 100 joints.

The scaphocerite (fig. 25c) is thrice as long as broad. The final tooth largely fails to reach the end of the lamella. This lamella is of about the same breadth over its entire length and is triangularly narrowed anteriorly.

The oral parts are quite typical.

The first pereiopods (fig. 25f) are relatively longer in old specimens, in these larger specimens they reach with a distinct part of the carpus beyond the scaphocerite, while in the younger only part of the chela reaches beyond that scale. The carpus is more than twice as long as the chela, which has the fingers about as long as the palm. The shape of the second pereiopod is extensively described by Cowles. The last three pereiopods (fig. 25g) are slender. The dactyli are provided with setae at their anterior margin. The propodus of the third leg is about 2.5 times as long as the dactylus, it is provided with some distinct movable spines at the posterior margin. The carpus is almost half as long as the propodus. The merus is somewhat longer and stronger than the propodus. The fifth leg is much more slender than the third, the propodus is almost thrice as long as the dactylus, its posterior margin bears, apart from some small spinules, several transverse rows of setae in the distal part. The carpus is slightly more than half the length of the propodus, while the merus is slightly shorter than the propodus. All joints are naked or provided with some few small and scattered spinules or hairs.

The pleopods (fig. 25h) are quite typical in shape.

The telson has the dorsal spinules very small. The posterior margin of the telson ends in a median spine, which overreaches the two longer inner spines of the posterior margin of the telson (fig. 25e). This character was first pointed to by Ortmann (1891) and indeed is very important. Between the two inner spines of the posterior margin of the telson four pairs of feathered setae are implanted, while a similar seta is present below the median posterior point of the telson.

De Man (1879) described *Palaemon Rosenbergii* as a species distinct from *Palaemon carcinus* auctt., later he considered *P. Rosenbergii* to be only a variety of *P. carcinus* auctt. In my opinion the two forms cannot be regarded even as varieties. The differences between *Palaemon Rosenbergii* De Man and *Palaemon carcinus* auctt. mentioned by De Man are:

1. The rostrum is almost straight in *P. rosenbergii,* not convex as in *P. carcinus* auctt.

2. The telson in *P. rosenbergii* is somewhat rounded at the end and is not slender and acuminate as in *P. carcinus* auctt.

The first difference falls within the range of variation of the shape of the rostrum. The rostrum in De Man's very old female, which could be studied, is a little arched over the eye and has the tip curved slightly upwards, the rostrum certainly is not quite straight. The telson of the type specimen of *Palaemon Rosenbergii* has the tip broken and the remaining part regenerated, the telson namely is very short and the position of the two dorsal pairs of spinules, the posterior of which is placed very close to the posterior margin, also make it clear that the telson is damaged, moreover the telson ends abruptly in a broad posterior margin, which shows no trace of spines or setae. The fact that the telson of the type specimen of *P. Rosenbergii* is damaged was already supposed by Ortmann (1891). We are thus fully justified to consider *Palaemon Rosenbergii* De Man a synonym of *Palaemon carcinus* auctt. (non *Cancer Carcinus* Linnaeus).

Palaemon spinipes described by Schenkel (1902) too can not be separated from the present form. All the differences mentioned by Schenkel fall within the range of variation of the various characters of the species dealt with here. Schenkel's *Palaemon spinipes* var. *birmanicus,* however, belongs to *Macrobrachium malcolmsonii* as pointed out on p. 121.

The present species is named by most authors *Palaemon carcinus*. As already shown (p. 3) the name *Palaemon* may not be used for this genus, because *Macrobrachium* is the correct name. Also the specific name *carcinus* up till now mostly is incorrectly assigned to the present form.

The original description of Linnaeus's (1758) *Cancer Carcinus* runs as follows:

"C.[ancer] macrourus, thorace laevi, manibus teretiusculis: brachiis hispido-aculeatis.

Sloan. jam. 2. *p.* 271. *t.* 245. *f.* 2. Astacus fluviatilis major, chelis aculeatis.

Habitat in Americae *fluviis*".

The definition of course fits for many species of *Macrobrachium,* but the reference to Sloane's work and the remark that the species lives in American rivers definitively exclude the possibility that *Cancer carcinus* is identical with our present form. The species described and figured by Sloane is at present best known under the name *Palaemon jamaicensis* (Herbst), this species thus has to bear the name *Macrobrachium carcinus* (L.), while the present species needs another name. In the twelfth edition of the Systema Naturae, Linnaeus (1767) gave the same definition as in the tenth edition, while also the remark about the habitat of the species is the same; here, however, Linnaeus refers to two more authors, namely to Seba (1761, vol. 3, pl. 31 fig. A) and to Rumphius (1705, pl. 1 fig. B). Seba's animal belongs to the same species as that of Sloane (1725), the specimen figured by Rumphius distinctly belongs to the present species. Linnaeus thus wrongly identifies Rumphius's species with *Cancer Carcinus.* Fabricius (1775, 1781, 1787, 1793) gives for *Astacus carcinus* almost the same definition as Linnaeus for his *Cancer Carcinus,* only "C. macrourus" is replaced by "A.[stacus] antennis posticis bifidis" the references in Fabricius's works (besides the reference to Linnaeus, 1767, Systema Naturae, ed. 12, p. 105) are the same as in the twelfth edition of Linnaeus' Systema (in Fabricius's Mantissa the references and the habitat are omitted). Herbst (1792) is the first to separate the two forms as distinct species, unfortunately he gives the name *carcinus* to the Indian form, which he, however, believes to occur also in America, he therefore refers here besides to Rumphius, also to Linnaeus, Fabricius, Seba and Sloane; Herbst's description and figure leave no doubt as to the identity of his *Cancer* (*Astacus*) *carcinus* with the present form. The American form is very well described and figured by Herbst under the name *Cancer* (*Astacus*) *Jamaicensis*; here he refers to Gronovius and strangely enough also to Sloane, so that Sloane's *Astacus fluviatilis* is mentioned by Herbst as a synonym of his *Cancer* (*Astacus*) *Jamaicensis* as well as of his *Cancer* (*Astacus*) *Carcinus.* In his Supplementum Entomologiae Systematicae Fabricius (1798) gives a definition of *Palaemon carcinus,* which differs very much from that in his previous works: "P.[alaemon] chelis aequalibus porrectis muricatis, rostro adscendente antennarum squamis longiore". The references and habitat are the same as in his other works. After the habitat he adds: "Corpus amoene coeruleo variegatum. Pedes laeues". There is no doubt that Fabricius with this definition means to indicate the Indian form, in which the rostrum generally is distinctly longer than the scaphocerite and which mostly has the body of a blue colour. His indication "Habitat in Americae fluuiis" and part of his references thus are incorrect. Bosc (1901) gives a French translation of Fabricius's (1798) text. Latreille (1802) also gives Fabricius's definition and references; he, however, adds the following remark: "Je soupçonne que le palémon carcinus de Fabricius n'est pas le cancer du même nom de Linnaeus. A ce dernier répondent les synonymes suivans: Seba, Mus. tom. III, tab. 21, fig. 4. — Sloan. Jamaïc. tom. II, pl. ccxlv, fig. 2. — Herbst, Canc. tab. 27, fig. 2.

Le palaemon carcinus de Fabricius est l'espèce figurée par Herbst, pl. xxviii, fig. 1, et par Rumphius, tab. 1, B."

In the later works the name *jamaicensis* always is used for the American, the name *carcinus* for the Indo-westpacific form, only Leach (1815) named the American form *Palaemon carcinus*, while his figure and name are used by Latreille (1818) in the Tableaux encyclopédiques et méthodiques. The first who after Latreille (1802) drew attention to the fact that *Cancer Carcinus* L. is different from *Palaemon carcinus*, is, as far as I know, Sunier (1925), who in a very short note in the proceedings of a session of the Netherlands Zoological Society pointed to this fact. As the name *carcinus* could not be used for the Indian form, Sunier proposed the name *Palaemon d'Acqueti* for this species, in honour of Dr. Henricus d'Acquet, burgomaster of Delft (1632-1706), who lent a specimen of the present species from his cabinet to let it be figured for plate I in Rumphius's Rariteitkamer. Sunier's name, however, cannot be used as the name *Rosenbergii* given by De Man to the same species is older. As far as I know no other valid name is given to the present species (the name *Palaemon spinipes* Schenkel, 1902, besides being younger than *Palaemon Rosenbergii* De Man, 1879, is preoccupied by the name *Palaemon spinipes* Desmarest, 1817, for a fossil species), so that the correct name of it is *Macrobrachium rosenbergii* (De Man).

The Siboga specimens have already been mentioned by De Man (1908), the specimens in the Leiden Museum labelled Siam, Java, Borneo, Makassar and Andai have been mentioned by De Man (1879), those from Pontianak and Tepuh by De Man (1898). The specimen from Andai is the type of the species.

The species is named in Java "udang satang"; in Borneo, near Balikpapan the natives call the species "udang galah". The word "udang" means "prawn", the significance of "satang" as well as of "galah" is "a long pole", the name refers to the very long chelipeds of the large males.

Distribution: This freshwater prawn, which occurs rather often in brackish and occasionally in salt water is recorded in literature from: Indian Ocean (Olivier, 1811; Lamarck, 1818; Desmarest, 1823, 1825; Voigt, 1836; H. Milne Edwards, 1837; 1838), East India (Herbst, 1792), Mandi, Punjab, N.W. India (Doflein, 1900), Surat (Rai, 1933), Bombay (Henderson, 1893; Sharp, 1893; Rai, 1933), Malabar District, S. India (Henderson & Matthai, 1910), Cochin State (Henderson & Matthai, 1910; Menon, 1938), Travancore State, S. India (Henderson & Matthai, 1910; Panikkar, 1937; Nataraj, 1942), Ceylon (Tennent, 1861; Doflein, 1900), surroundings of Madras, Chingleput District (Henderson & Matthai, 1910), Madras (Henderson, 1893), Rajahmundry and Cocanada, Godaveri District (Henderson & Matthai, 1910), Ganjam (Henderson, 1893), Orissa (Doflein, 1900), Garia near Calcutta (Kemp, 1918), Calcutta (Von Martens, 1868; Henderson, 1893), Ganges (H. Milne Edwards, 1837), Hooghly River (Sharp, 1893), Sundarbans (Henderson, 1893), Sittang, Burma (Henderson, 1893), Tavoy, Tenasserim (Henderson, 1893), Mergui Archipelago (De Man, 1888a), Georgetown, Penang (Boone, 1935), Singapore (Von Martens, 1868, 1876; Walker, 1887; De Man, 1897), Kelantan, Malay Peninsula (Lanchester, 1901), Siam (De Man, 1879), Patani River, Siamese Malay States (Kemp, 1918a), Singora, Siamese Malay States (Lanchester, 1901; Kemp, 1918a), Tale Sap, Siamese Malay States (Lanchester, 1901; Suvatti, 1937), Patalung River, Siamese Malay States (Kemp, 1918a), Menam at Pakret, Siam (Suvatti, 1937), Klong Ranode, Siam (Suvatti, 1937), Dha Luang, Siam (Suvatti, 1937), Nontaburi, Siam (Suvatti, 1937), Bangkok, Siam (Von Martens, 1868; Pearse, 1933; Suvatti, 1937), Tale Noi, Siam (Suvatti, 1937), Menam Chao Phya, Bangsorn, Siam (Suvatti, 1937), Cochinchina (Serène, 1937), Saigon, Cochinchina (Ortmann, 1891;

Thompson, 1901), Cauda near Nha Trang, Annam (Serène, 1937), Hongkong (Thompson, 1901), ? Yedo and Yokohama, Japan (Von Martens, 1868) [1]), Manila, Luzon (Casto de Elera, 1895), San Juan and Pasig Rivers, Luzon (Cowles, 1914; Estampador, 1937), Laguna de Bay, Luzon (Cowles, 1914), Rio Bical, S. Luzon (Von Martens, 1868), Naujan Lake near Calapan, Mindoro (Cowles, 1914; Estampador, 1937), Takloban, Leyte (Von Martens, 1868), Sebu (Thallwitz, 1892), Baram River, Sarawak (De Man, 1902), Sarawak (Lanchester, 1900; Nobili, 1900), Kophiang near Mandor, W. Borneo (Von Martens, 1868), Pontianak, S. W. Borneo (De Man, 1898), Sintang, West Borneo (Von Martens, 1868), Tepuh near Samarinda, E. Borneo (De Man, 1898a), Mahakam (= Kutei) River, E. Borneo (De Man, 1908), Borneo (De Man, 1879), Musi River near Muaraklingi, Sumatra (J. Roux, 1932), Palembang, Sumatra (Von Martens, 1868; De Man, 1892; J. Roux, 1932), Sumatra (Schenkel, 1902), Tjimandiri River, W. Java (J. Roux, 1932), Java (De Man, 1879; Miers, 1880), Bali (Miers, 1880), Pajeti, Sumba, (J. Roux, 1928a), Kema, N. Celebes (Schenkel, 1902), N. Celebes (Thallwitz, 1892), Makassar, S. W. Celebes (De Man, 1879, 1892), Tobelo, Halmahera (De Man, 1902), Waigeo, off N. W. New Guinea (J. Roux, 1923), Pioneer bivouac, Mamberamo River, Dutch N. New Guinea (J. Roux, 1927) Andai, N. W. New Guinea (De Man, 1879; Nobili, 1899), Van der Sande River, S. W. New Guinea (J. Roux, 1923), Lorentz River near Kloof bivouac, near Alkmaar, Sabang, Regen Island and Bivak Island, S. W. New Guinea (J. Roux, 1921), Merauke, S. W. New Guinea, (J. Roux, 1917), Katau near the mouth of the Fly River, Papua (Nobili, 1899), Katherine River, N. Australia (J. Roux, 1933a), Flying Fish Cove, Christmas Island (Gordon, 1935).

Macrobrachium lamarrei (H. Milne Edwards)

Palemon Lamarrei H. Milne Edwards, 1837, Hist. nat. Crust., vol. 2, p. 397.
non *Palaemon Lamarrei* White, 1847, List Crust. Brit. Mus. p. 78.
non *Palemon Lamarrei* De Haan, 1849, Fauna Japonica, Crust., p. 171.
non *"Palaemon Lamarrei?"* Smith, 1869, Trans. Connect. Acad. Arts Sci., vol. 2, p. 40
non *Palaemon Lamarrei* De Man, 1879, Notes Leyden Mus., vol. 1, p. 166.
? *Palaemon Lamarrei* Henderson, 1893, Trans. Linn. Soc. Lond. Zool., ser. 2 vol. 5, p. 442.
non *Palaemon lamarrei* Ortmann, 1893, Ergebn. Plankton-Exped., vol. 2Gb, p. 48.
Palaemon lamarrei De Man, 1897, Zool. Jb. Syst., vol. 9, p. 767.
non *Palaemon lamarrei* Nobili, 1897, Boll. Mus. Zool. Anat. comp. Torino, vol. 12 n. 280, p. 5.
non *Palaemon lamarrei* Doflein, 1899, S. B. Bayer. Akad. Wiss., vol. 29, pp. 177, 185.
non *Palaemon carcinus Lamarrei* Lanchester, 1900, Ann. Mag. nat. Hist., ser. 7 vol. 6, p. 263.
non *Bithynis lamarrei* Young, 1900, Stalk-eyed Crust. Brit. Guian., p. 487.
non *Palaemon carcinus lamarrei* Lanchester, 1901, Proc. zool. Soc. Lond., 1901, p. 565.
non *Palaemon lamarrei* Thompson, 1901, Catal. Crust. Mus. Dundee, p. 19.
Palaemon (*Eupalaemon*) *lamarrei* De Man, 1908, Rec. Indian Mus., vol. 2, p. 222, pl. 19 fig. 4.
Palaemon lamarrei Henderson & Matthai, 1910, Rec. Indian Mus., vol. 5, p. 301.
Palaemon lamarrei Kemp, 1915, Mem. Indian Mus., vol. 5, p. 265.
Palaemon Lamarrei Sunier, 1925, Tijdschr. Nederl. dierk. Ver., ser. 2 vol. 19, p. cxv.
Palaemon lamarrei Balss, 1930, Ergebn. Biol., vol. 6, p. 318.
Palaemonetes lamarrei Arndt, 1933, Mitt. zool. Mus. Berlin, vol. 19, p. 250.
Palaemon lamarreii Hora, 1933, Curr. Sci., vol. 1, pp. 4, 5.

1) Von Martens expresses his doubts as to the correctness of the labelling of his specimens from "Japan".

Palaemon lamarrei Sewell, 1934, Rec. Indian Mus., vol. 36, pp. 53, 55, 58.
Palaemon lamarrei Nath, 1937, Journ. Morph., vol. 61, p. 149, pls. 1-3.
Palaemon lamarrei Chopra, 1939, Journ. Bombay nat. Hist. Soc., vol. 41, p. 223, pl. 1 fig. 6.
Palaemon lamarrei McCay & White, 1941, Indian med. Gazette, vol. 76, p. 38.
Palaemon lamarrei Chopra & Tiwari, 1949, Rec. Indian Mus., vol. 45, p. 214.

Museum Amsterdam:

Port Canning; from Indian Museum, Calcutta; coll. J. G. de Man. — 4 juveniles 22-29 mm.
Calcutta; from Indian Museum, Calcutta; coll. J. G. de Man. — 4 juveniles 23-32 mm.

The present specimens form part of the material described by De Man (1908). I have nothing to add to De Man's extensive description. The exopods of the uropods have their outer margins ending in a single tooth, the small accessory spine, as is present at the inner side of the final tooth in most species of Palaemonidae, lacks in all my specimens of the present species.

The South American specimens identified by various authors with *Palaemon lamarrei* belong in reality to *Macrobrachium amazonicum*. As already pointed out by De Man (1879) and confirmed by Sunier (1925) the specimen named by De Haan (1849) *Palaemon Lamarrei,* which should originate from Japan, is identical with *Macrobrachium amazonicum* (Heller). Except De Haan's spirit specimen of "*Palaemon Lamarrei*", which still is present in the collection of the Leiden Museum and which could be examined by me, a second specimen of *Macrobrachium amazonicum* was found by Mr. Martin D. Burkenroad among the dry material of Japanese Penaeidae studied by De Haan. The Bopyrid parasite carried by De Haan's spirit specimen under the carapace belongs to *Probopyrus bithynis* Richardson (1904) (= *Probopyrus floridensis* Rich. var. *gigas* Nierstrass & Brender à Brandis, 1925) a species which is common in the West Indies, parasiting on various species of *Macrobrachium* (vid. Sunier, 1925, and Nierstrass & Brender à Brandis, 1925). Herewith the identity of De Haan's specimen is finally settled; it obviously does not originate from Japan, but from the West Indies. The fact that some West Indian material by some error or other has been mixed with De Haan's Japanese material also is confirmed by the fact that De Haan's new species *Palaemon brevicarpus* proves to belong to *Macrobrachium carcinus* (L.) (= *Palaemon jamaicensis* (Herbst)), one of the most common species from the West Indies.

Of the specimens recorded by Henderson (1893) as *P. Lamarrei* from Ganjam, too little is known to ascertain the correctness of Henderson's identification the identity of the specimens is the more incertain as Henderson himself regards them as young specimens of "*Palaemon carcinus*".

Lanchester's (1900) specimens from the Malay Peninsula, recorded under the name *Palaemon carcinus* var. *Lamarrei* do not belong to the present species. Lanchester namely gives as rostral formula $\frac{12}{10}$, a formula never shown by *M. lamarrei,* he furthermore states "there is a wide gap between teeth 8-9 above", this should mean that there are 4 subapical teeth dorsally, a character not shown by either *M. lamarrei* or the two other forms in which the rostrum has the ultimate portion unarmed, *M. malcolmsoni* and *M. weberi.* In all probability Lanchester's specimen is a specimen of *Macrobrachium rosenbergii* (De Man) in which the 8th and 9th tooth are more remote from one another than from the other teeth. The characters of the prickly second legs and the size are in good agreement with those of *M. rosenbergii,* too. The specimen of unknown

locality referred by Lanchester (1901) to *Palaemon carcinus lamarrei* is, as already pointed out by Kemp (1918), a specimen of *Macrobrachium rosenbergii* (De Man) (= *Palaemon carcinus* auctt.).

Arndt (1933) mentions the present species under the name *Palaemonetes lamarrei,* this of course is an error as it distinctly belongs to the genus *Macrobrachium* as is shown by the presence of a well developed three-jointed mandibular palp and the presence of a hepatic and absence of a branchiostegal spine.

Distribution: The species seems to be confined to India. It is recorded from: Near Lahore (Nath, 1937), Patna State (Chopra & Tiwari, 1949), Bengal coasts (H. Milne Edwards, 1837), N.W. Bengal, 130 miles from Calcutta (Mc Cay & White, 1941), Calcutta (De Man, 1908), Saltwater lake near Calcutta (Sewell, 1934), Port Canning (De Man, 1908), Uttarbhag, Lower Bengal (Hora, 1933), Barkul and Rambha, Chilka Lake (Kemp, 1915), ? Ganjam (Henderson, 1893), Villivakkam near Madras (Henderson & Matthai, 1910). The species occurs in fresh and brackish waters sometimes it is subterranean.

Macrobrachium malcolmsonii (H. Milne Edwards)

Palemon Malcolmsonii H. Milne Edwards, 1844, Voy. Inde Jacquemont, vol. 4 pt. 2, p. 8, atlas, vol. 2, pl. 21.
Palaemon spinipes birmanicus Schenkel, 1902, Verh. naturf. Ges. Basel, vol. 13, p. 503, pl. 9 fig. 8.
Palaemon malcolmsonii Henderson & Matthai, 1910, Rec. Indian Mus., vol. 5, p. 283, pl. 15 fig. 2.
Palaemon malcolmsoni Kemp, 1915, Mem. Indian Mus., vol. 5, p. 266.
Palaemon malcolmsonii Balss, 1930, Ergebn. Biol., vol. 6, p. 318.
Palaemon malcolmsonii Patwardhan, 1937, Indian zool. Mem., vol. 6, p. 1, figs. 1-65.
Palaemon malcolmsonii Chopra, 1939, Journ. Bombay nat. Hist. Soc., vol. 41, p. 223, pl. 2 fig. 3.
Palaemon malcolmsonii Chopra, 1943, Indian Sci. Congr. vol. 30 pt. 2 sect. 6, p. 5.
Palaemon malcolmsonii Chopra & Tiwari, 1949, Rec. Indian Mus., vol. 45, p. 214.

The present species, of which no specimens are at my disposal, is closely related to *Macrobrachium weberi.* The differences between the two species will be dealt with under the latter species.

Schenkel (1902) described a new species under the name *Palaemon spinipes*; his specimens, however, belong in reality to *Macrobrachium rosenbergii.* Of his new species Schenkel also described a new variety *Palaemon spinipes* var. *birmanicus.* The specimens of this new variety show all characters mentioned and figured by Henderson & Matthai for *M. malcolmsonii,* so that I see no reason whatever to separate the two forms.

Distribution. The species inhabits fresh and salt waters. It is only known from the eastern part of India and from Burma. The records in literature are: Trichonopoly, S. India (Henderson & Matthai, 1910), Tanjore and Tranquebar, Tanjore District (Henderson & Matthai, 1910), Karoor, Coimbatore District (Henderson & Matthai, 1910), Chingleput, Walajabad, Red Hills and Pallavaram, Chingleput and Madras Districts (Henderson & Matthai, 1910), Renigunta, North Arcot District (Henderson & Matthai, 1910), Bezawada Anicut, Kistna District (Henderson & Matthai 1910), Rajahmundri, Godaveri District (Henderson & Matthai, 1910), Surada Reservoir and Berhampur, Ganjam District (Henderson & Matthai, 1910), Nagpur (H. Milne Edwards, 1844), Barkul and Satpara, Chilka Lake (Kemp, 1915), Ang River at Agalpur, and Tel River at Belgaon, Patna State, India (Chopra & Tiwari, 1949), Bhamo and Mandalay, Burma (Schenkel, 1902).

Macrobrachium weberi (De Man) (fig. 26)

Palaemon (*Eupalaemon*) *Weberi* De Man, 1892, Weber's Zool. Ergebn., vol. 2, p. 421, pl. 25 fig. 33.
Palaemon weberi Borradaile, 1899, Willey's Zool. Res., vol. 4, p. 410.
Palaemon (*Eupalaemon*) *weberi* De Man, 1915, Zool. Jb. Syst., vol. 38, p. 420, pl. 28 fig. 7, pl. 29 fig. 7.
Palaemon (*Eupalaemon*) *weberi* J. Roux, 1917, Nova Guinea, vol. 5, p. 600.
Palaemon (*Eupalaemon*) *weberi* J. Roux, 1927, Nova Guinea, vol. 15, p. 322.

Museum Leiden

Sidenreng Lake, Celebes; 1888-1889; leg. M. Weber; cotypes. — 2 specimens 49 and 60 mm.
Minralang River, Celebes; 1888-1889; leg. M. Weber; cotypes. — 2 specimens 58 and 70 mm.
Hollandia, N. New Guinea; April 5, 1911; leg. K. Gjellerup; New Guinea Expedition, 1910-1911. — 5 specimens 67-74 mm (3 specimens bopyrized).
Zoutbron, N. New Guinea; 1910-1911; New Guinea Expedition, 1910-1911. — 1 specimen 88 mm.
N. New Guinea; 1910-1911; New Guinea Expedition, 1910-1911. — 4 specimens 55-75 mm.

Museum Amsterdam

Tjenrana River near Pampanuwa, Celebes; 1888-1889; leg. M. Weber; cotypes. — 31 specimens 25-85 mm.
Minralang River near Tempe, Celebes; 1888-1889; leg. M. Weber; cotypes. — 13 specimens 45-75 mm.
Lake Tempe, Celebes; leg. Eerdmans; cotype. — 1 specimen 110 mm (adult male).
Lake Sidenreng near Teteassi, Celebes; 1888-1889; leg. M. Weber; cotypes. — 4 specimens 56-90 mm.
Mosso River, N. New Guinea; May 9-12, 1903; New Guinea Expedition, 1903. — 5 specimens 75-87 mm.
Tawarin River, N. New Guinea; June 20, 1903; New Guinea Expedition, 1903. — 2 specimens 42 and 44 mm.
Waudu River, N. New Guinea; June 20, 1903; New Guinea Expedition, 1903. — 1 specimen 82 mm.
Hollandia, N. New Guinea; April 5, 1911; New Guinea Expedition, 1910-1911. — 2 specimens 76 and 88 mm (one bopyrized).
Locality unknown. — 1 specimen 53 mm.

De Man (1892, 1915) gave extensive descriptions of the present species. A large part of the material preserved in the two above Musea has served Dr. de Man for his descriptions, so that I have very little to add.

The antennula is normally shaped. In the adult male from Lake Tempe (coll. Mus. Amsterdam) the basal segment of the right antennule is abnormal in shape by having two distinct anterolateral spines, instead of one; the left antennule is normal.

The scaphocerite (fig. 26 a) is thrice as long as broad, it is of about the same breadth throughout its entire length, only close near the top and near the base it rapidly narrows. The final tooth is far overreached by the lamella. The oral parts are quite typical for the genus.

The first pereiopod is smooth, while the second to fifth legs are provided with scattered spines and hairs. The large chelae of the adult male have the palm covered with many small blunt spinules, the fingers are provided with a thick layer of closely packed hairs; when these hairs are removed, strange irregularly shaped squamiform structures may be seen, which are placed on the upper as well as on the lower finger. These structures in all probability consist of the same material

as the spines on the palm, and are present on both chelae of the adult male, so that it is in my opinion not very probable that they are abnormalities. The cutting edge of the dactylus of the large chela of the adult male bears two distinct teeth, while that of the fixed finger is provided with one large proximal tooth, behind which some small irregularly shaped teeth are visible. In the females and young males the third pereiopod reaches with part of the dactylus, in the adult male with part of the propodus, beyond the scaphocerite. The fifth leg overreaches the scaphocerite with a portion of the propodus. The merus of the third leg in the adult male is longer than the propodus.

The pleopods are quite normal.

The pleurae of the fifth abdominal segment have the apex rounded.

The telson is normal in shape, it is figured by De Man (1915). The anterior pair of dorsal spinules is placed about in the middle of the telson, the posterior pair is situated about halfway between the anterior pair and the posterior margin of the telson. The posterior margin ends in a strong median tooth, which is flanked at each side by two spines and a feathered seta. The inner spine distinctly overreaches the apex of the telson, the outer is very short (fig. 26 b).

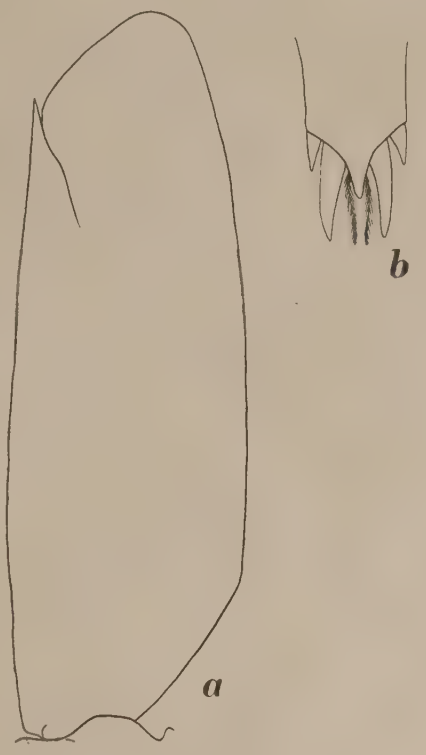

Fig. 26. *Macrobrachium weberi* (De Man). a, scaphocerite; b, tip of telson. a, × 8, b, × 24.

Distribution. The species is only known from fresh water. It is recorded in literature from Celebes, New Guinea and New Britain. Records in literature are: Lake Tempe and Minralang River near Lake Tempe, S.W. Celebes (De Man, 1892), Lake Sidenreng near Teteassi, S.W. Celebes (De Man, 1892), Tjenrana River near Pampanuwa, S.W. Celebes (De Man, 1892), Waudu River, Geelvink Bay, N. New Guinea (J. Roux, 1917), Pionier Bivouac, Mamberamo River, N. New Guinea (J. Roux, 1927), Tawarin River, Walckenaer Bay, N. New Guinea (J. Roux, 1927), Hollandia, N. New Guinea (De Man, 1915), Zoutbron, N. New Guinea (De Man, 1915), Moso River, N. New Guinea (J. Roux, 1917), Schultze Point, New Britain (Borradaile, 1899).

Macrobrachium caledonicum (J. Roux)

Palaemon (*Macrobrachium*) *caledonicus* J. Roux, 1926, Nova Caledonia, Zool., vol. 4, p. 224, figs. 52-54.

This species, of which no material is at my disposal, is closely related to *M. australe,* mainly differing from that species in the characters mentioned in the key. As Roux pointed out it also shows some resemblance to *M. latidactylus,* from which species, however, it at once may be distinguished by the fact that only few teeth of the rostrum are placed behind the orbit. The species is known from various localities in New Caledonia, but has not yet been reported outside that region.

Macrobrachium australe (Guérin-Méneville) (figs. 27-30)

Palaemon australis Guérin-Méneville, 1838, Duperrey's Voy. Coquille, Zool., vol. 2 pt. 2, p. 37.
Palaemon sundaicus Heller, 1862, S. B. Akad. Wiss. Wien, vol. 45 pt. 1, p. 414, pl. 2 figs. 38, 39.
Palaemon sundaicus Heller, 1865, Reise Novara Zool., vol. 2 pt. 3, p. 115.
Palaemon Danae Heller, 1865, Reise Novara Zool., vol. 2 pt. 3, p. 120, pl. 11 fig. 3.
Palaemon dispar Von Martens, 1868, Arch. Naturgesch., vol. 34 pt. 1, p. 41.
Palaemon alphonsianus Hoffmann, 1874, Rech. Faune Madagascar, vol. 5 pt. 2, p. 33, pl. 9 figs. 63-65.
Palaemon parvus Hoffmann, 1874, Rech. Faune Madagascar, vol. 5 pt. 2, p. 35, pl. 7 fig. 59.
Palaemon dispar Miers, 1879, Philos. Trans. Roy. Soc. Lond., vol. 168, p. 493.
Palaemon dispar Miers, 1880, Ann. Mag. nat. Hist., ser. 5 vol. 5, p. 383.
Palaemon Malliardi Richters, 1880, Beitr. Meeresf. Maur. Seych., p. 166, pl. 18 figs 1-3.
Palaemon Danae Haswell, 1882, Catal. Aust. Crust., p. 197.
Palaemon dispar De Man, 1888, Arch. Naturgesch., vol. 53 pt. 1, p. 556.
Palaemon dispar Ortmann, 1891, Zool. Jb. Syst., vol. 5, p. 718.
Palaemon sundaicus Ortmann, 1891, Zool. Jb. Syst., vol. 5, p. 719.
? *Palaemon danae* Ortmann, 1891, Zool. Jb. Syst., vol. 5, p. 719.
Palaemon parvus Ortmann,1891, Zool. Jb. Syst., vol. 5, p. 720.
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Siboga Expedition

Station 4, Anchorage off Djangkar, E. Java, 7° 42′ S, 114° 12′.6 E; shore; depth 9 m; bottom coarse sand; March 9, 1899. — 2 specimens 24-34 mm.
Station 47, Bay of Bima, Sumbawa; trawl, dredge and shore exploration; depth 55 m; bottom mud, with patches of fine coral sand; April 8-12, 1899. — 7 specimens 15-20 mm.
River near Station 53, Bay of Nangamesi, Sumba; April 21 and 22, 1899. — 16 specimens 22-25 mm (1 specimen bopyrized).
Station 58, Anchorage off Seba, Sawu Island; dredge and shore exploration; depth up to 27 m; bottom sand; April 25, 1899. — 1 ovigerous female 70 mm, and 5 juveniles 21-24 mm.
River near Station 114, Kuandang Bay entrance, 0° 58′.5 N, 122° 55′ E; July 8, 1899. — 4 specimens 24-30mm.

Snellius Expedition

Beo, Talaud Islands; fresh water; June 14-21, 1930. — 1 specimen 89 mm.
Rivulet at Amboina; September 13, 1930. — 5 specimens (included 2 ovigerous females) 48-70 mm. (1 specimen bopyrized).

Museum Leiden

We Island, off N. Sumatra; February, 1927, July, 1930; leg. P. Buitendijk. — 4 specimens (1 ovigerous female) 57-90 mm.
Tjisanggiri River near desa (= village) Kalong, S.W. Java; June 15 and 16, 1939; leg. C. P. J. de Haas. — 58 specimens 12-26 mm.
Tjimangke River near desa Tjidjambe, S.W. Java; June 13 and 14, 1939; leg. C. P. J. de Haas. — 3 specimens 17-18 mm.
Tanahabang, Weltevreden, near Batavia; March 2, 1908; leg. P. N. van Kampen. — 7 specimens 36-40 mm.
Berit River, Flores; 1888-1889; leg. M. Weber. — 2 specimens 54 and 58 mm.
Maumere, Flores; 1891; leg. H. ten Kate. — 2 ovigerous females 65 and 77 mm.
Besar Island (= Groot Bastaard), off N.E. Flores; 1891; leg. H. ten Kate. — 1 specimen 92 mm.
North Sumba; leg. H. ten Kate. — 1 ovigerous female 61 mm.
Koinino River near Kupang, Timor; 1888-1889; leg. A. Wichmann. — 1 specimen 41 mm.
Air Lorike, Hitu Peninsula, Amboina; March 17, 1923; leg. F. Kopstein. — 25 specimens (included 1 ovigerous female) 17-49 mm (1 specimen bopyrized).
Amboina; in rapidly running mountain rivulets and waterfalls; October, 1922; leg. F. Kopstein. — 1 specimen 39 mm.
Armo River near Jahari, N. New Guinea; August 28, 1910 or Tarfia, N. New Guinea; fresh water; September 10, 1910; leg. K. Gjellerup. — 1 specimen 84 mm.
Oinaké River, N. New Guinea; May 31, 1910; New Guinea Expedition, 1910-1911; leg. K. Gjellerup; cotypes of *Leander lepidus* De Man. — 3 specimens 18-20 mm.
Tahiti; Museum Godeffroy. — 1 specimen 41 mm.

Museum Amsterdam

Lolowau, S. Nias; 1910; leg. J. P. Kleiweg de Zwaan. — 10 specimens 41-96 mm.
Western Nias; leg. J. P. Kleiweg de Zwaan. — 71 specimens (included ovigerous females) 44-80 mm (1 specimen bopyrized).
Nias; 1910; leg. J. P. Kleiweg de Zwaan. — 1 specimen 60 mm.
Sungai Pati Bubur near Airbangis, Padangsche Bovenlanden (Hills near Padang), W. Sumatra; fresh water; November, 1913; leg. E. Jacobson. — 6 specimens 32-56 mm.
Sibolga, W. Sumatra; fresh water; August, 1913; leg. E. Jacobson. — 1 specimen 35 mm.
Buleleng, Bali; January 25, 1907. — 3 specimens 53-60 mm.
River near Berit, Flores; fresh water; 1888-1889; leg. M. Weber. — 15 specimens (1 ovigerous female) 11-68 mm.
Rivers near Berit and near Reo, Flores; 1888-1889; leg. M. Weber. — 13 specimens 24-57 mm.
River near Raka-mbaha, Flores; upstreams of a waterfall; 1888-1889; leg. M. Weber. — 4 specimens (1 ovigerous female) 46-62 mm.
Dona River near Ende, Flores; 1888-1889; leg. M. Weber. — 1 specimen 57 mm.
Ba River near Ende, Flores; 1888-1889; leg. M. Weber. — 6 specimens (included 3 ovigerous females) 32-69 mm.
Nargi River near Konga, Flores; 1888-1889; leg. M. Weber. — 2 specimens (1 ovigerous female) 49 and 62 mm.
River near Konga, E. Flores; October 30, 1909; leg. G. A. J. van der Sande. — 8 specimens (included ovigerous females) 38-62 mm.
Tanah merah, Adonara Island, E. of Flores; 1888-1889; leg. A. Wichmann. — 4 specimens 44-58 mm.
Pajeti, Sumba; July, 1924; leg. P. J. Lambooy. — 18 specimens (included ovigerous females) 37-105 mm (1 specimen bopyrized).
River near Kupang, Timor; several m above springtide; May 13, 1908; leg. G. A. J. van der Sande. — 15 specimens (included 1 ovigerous female) 16-42 mm.
Koinino River near Kupang, Timor; 1888-1889; leg. A. Wichmann. — 8 specimens 45-72 mm.
Tjenrana River, near Pampanuwa, Celebes; 1888-1889; leg. M. Weber. — 1 specimen 76 mm.
River near Parepare, Celebes; 1888-1889; leg. M. Weber. — 2 specimens 45 and 52 mm.
Bonea River, Salajar, off S. E. Celebes; 1888-1889; leg. M. Weber. — 1 specimen 74 mm.
Amboina; leg. J. Brock; coll. J. G. de Man. — 1 specimen 50 mm.
Tubah River, W. Ceram; February 7, 1910; leg. L. F. de Beaufort. — 2 specimens 64 and 98 mm.
Rivulet near Keratu, W. Ceram; February 20, 1910; leg. L. F. de Beaufort. — 4 specimens 38-44 mm.
Waiho River, Waigeo; upstreams of a rapid; December 20, 1909; leg. L. F. de Beaufort. — 3 specimens 44-48 mm.
Wai La River, Waigeo; January 18, 1910; leg. L. F. de Beaufort. — 1 ovigerous female 74 mm.
Wai Meniel River, Waigeo; January 5, 1910; leg. L. F. de Beaufort. — 2 specimens 65 and 72 mm.
Klipong, N. New Guinea; July 9, 1903; New Guinea Expedition, 1903. — 4 specimens 41-54 mm.
Moso River, N. New Guinea; May 9-12, 1903; New Guinea Expedition, 1903. — 4 specimens 58-84 mm.

Description. The rostrum reaches to or slightly beyond the end of the scaphocerite, the tip is curved upward (only in large specimens the rostrum fails to reach the end of the scaphocerite). The upper margin is provided with 9-13 (mostly 10 or 11) teeth, the first two or three (seldom the first 4) of which are placed on the carapace behind the orbit. The teeth are large and generally widely separated, often the distance between the ultimate (anterior) and penultimate teeth is much larger than that between the other teeth, sometimes the distance between the first (posterior) and the second teeth is larger than that between the second and the third tooth. The lower margin bears

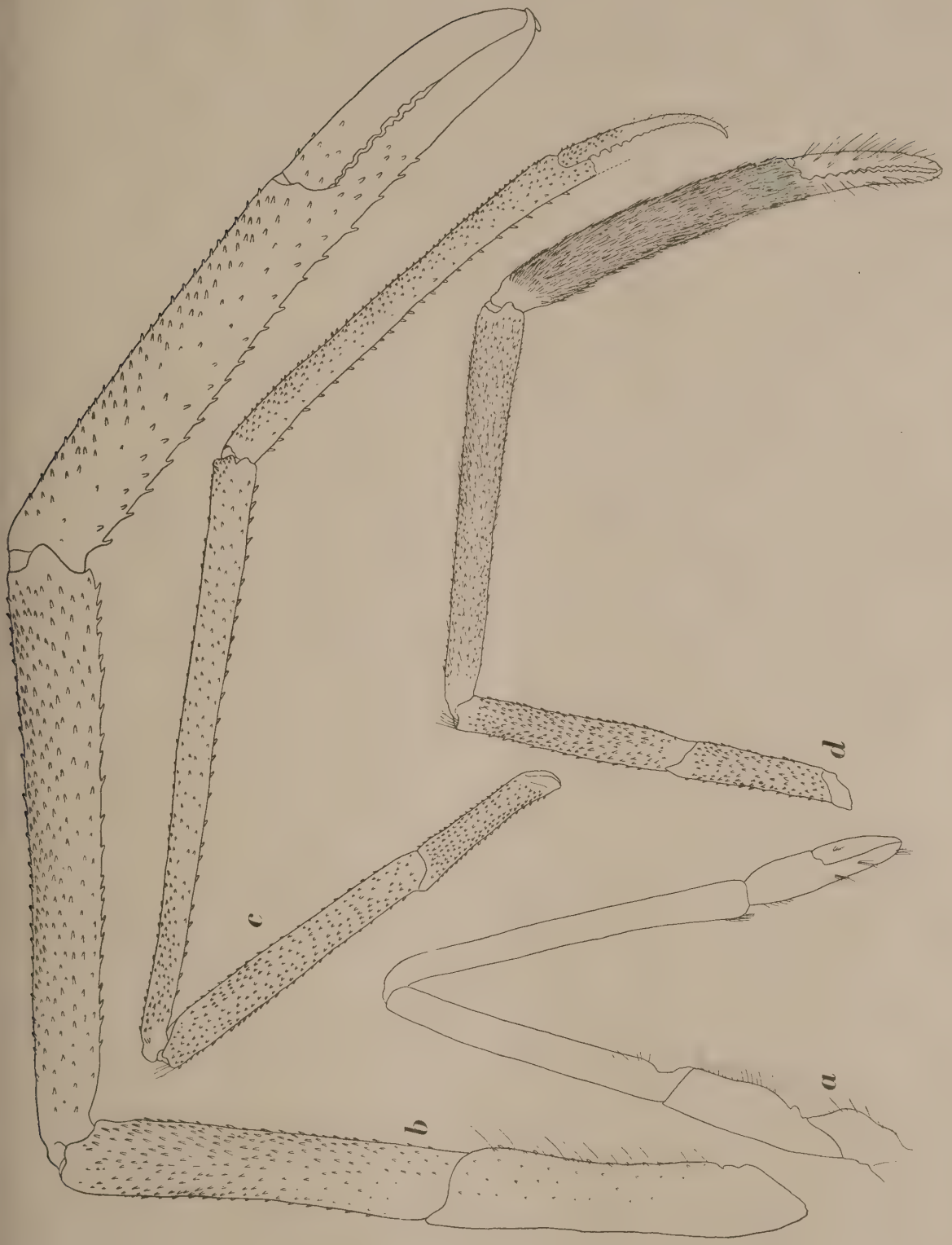

Fig. 27. *Macrobrachium australe* (Guérin). a, first pereiopod; b, second pereiopod of female; c, larger second pereiopod of male; d, smaller second pereiopod of male. a, b, × 8; c, d, × 2.

2-6 teeth (generally 3, and very rarely 8). The carapace is smooth, in adult males it is somewhat roughened by spinules in the anterior and ventral regions. The hepatic spine is smaller than the antennal and is placed on a distinctly lower level.

The apex of the fifth abdominal segment is about rectangular and ends in a rather acute point. The length of the fifth segment is about $^3/_4$ to $^2/_3$ of that of the sixth segment.

The telson is about 1.5 times as long as the sixth abdominal segment or is somewhat shorter. It bears the usual armament of 2 pairs of dorsal spines. The telson gradually narrows posteriorly, the posterior margin ends in a distinct median point, which is flanked by two pairs of spines and several feathered setae. The inner spines distinctly overreach the apex of the telson.

The eyes are large, the cornea is about as long as, but distinctly broader than the stalk. A distinct ocellus is present.

The antennular peduncle is quite typical in shape.

The scaphocerite (fig. 28 a) is elongate, its outer margin is straight or slightly convex, the inner margin is somewhat concave. The greatest breadth lies just above the base, towards the top the scale narrows rapidly. The lamella distinctly overreaches the final tooth.

The oral parts are quite typical in shape.

The first pereiopod (fig. 27 a) reaches with about the entire chela beyond the scaphocerite in the adult male, in the females and the young males it reaches with the fingers only beyond the scaphocerite or even just fails to reach the end of that scale. The fingers are as long as the palm. The carpus is twice to slightly more than twice as long as the chela (in adult males it is relatively longer than in the females). The merus measures $^4/_5$ of the length of the carpus. The ischium is about half as long as the merus. The second pereiopods in the adult male are distinctly unequal in shape and length. The larger leg (fig. 27 c) reaches with a large part of the merus beyond the scaphocerite. The fingers are slender and measure slightly less than $^2/_5$ of the length of the palm. The dactylus is provided with small sharp spinules, which are placed closest together in the basal portion of the dactylus. The cutting edge of the dactylus is provided with numerous (about 20) denticles over the entire length; these denticles are largest in the proximal part, becoming smaller and less distinct anteriorly. The palm is elongate and cylindrical, it is more than 10 times as long as broad and covered with numerous spinules; these spinules are smallest and placed closest together in the upper and outer surface of the palm: the spinules of the lower and inner surfaces are distinctly longer and placed farther apart from one another. Some scattered hairs are present on the chela, they are however, most distinct on the fingers; no velvety hair covering is present either on the palm or on the fingers. The carpus is as long as the length of the chela or is slightly shorter (up to $^7/_9$ of the length of the chela), it is widest distally and narrows proximally, it shows the same armament of spinules as does the palm. The merus is slightly more than half as long as the carpus; the ischium is $^1/_2$ to $^5/_8$ as long as the merus. Both merus and ischium are covered with many spinules, while a velvety coat of short hairs is present on the ischium and merus and sometimes also in the dorsal part of the carpus. The smaller second leg in the adult male (fig. 27 d) reaches with the entire carpus or only with part of it beyond the scaphocerite. The fingers are slender and measure about $^2/_5$ to $^1/_2$ of the length of the palm. Like in the larger leg the cutting edges of both dactylus and fixed finger are provided with numerous denticles over their entire length; here too the denticles diminish in size gradually distally. Both fingers are provided with spinules, which are most numerous in the proximal portion. The palm is relatively shorter than in the larger leg, it is also less slender, being

6-8 times as long as broad. Like in the larger leg the smaller leg has the palm covered with spinules, but these spinules are entirely obscured by a thick velvety coat of rather long hairs, which cover the entire palm and the bases of the fingers. The carpus is slightly shorter than the chela. The merus measures $^4/_7$ of the length of the carpus. The ischium is about $^2/_3$ of the length of the merus. The carpus, merus, and ischium show similar spinules as in the larger leg. A velvety coat of hairs is present on all these three segments; these velvety hairs are similar to those of the merus and ischium of the larger leg, but distinctly shorter than those of the palm of the smaller leg. The very old male

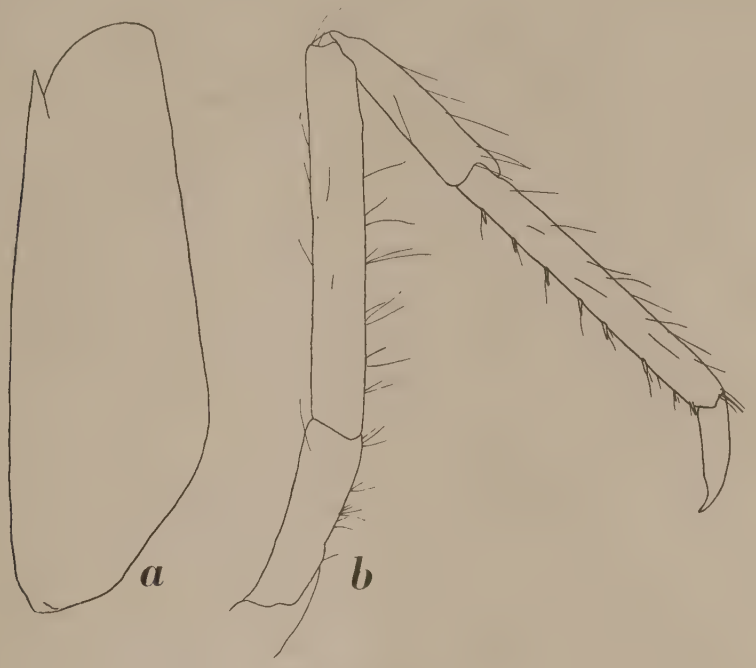

Fig. 28. *Macrobrachium australe* (Guérin). a, scaphocerite; b, third pereiopod. a, b, × 7.

from Pulu Besar (Leiden Museum) possesses only one of the second legs, presumably the shorter; this leg differs from the above description by having the fingers $^3/_5$ of the length of the palm and the carpus distinctly shorter than the chela. The tubercles and hairs are worn off. In the ovigerous females (length about 70 mm) the chelae (fig. 27 b) are equal in length and shape. They reach with the ultimate third (or somewhat more) of the carpus beyond the scaphocerite. The fingers are slender, they measure $^2/_3$ of the length of the palm. The cutting edge of the fingers is armed in the proximal half with 4 to 6 small teeth, which distally become gradually less conspicuous, the distal half of the cutting edge is entire. The palm is about thrice as long as broad. The carpus is slightly shorter than the chela (in very young specimens it is often longer than the chela). The merus is $^2/_3$ of the length of the carpus. The ischium is as long as or even slightly longer than the merus. All limbs are provided with stiff and long hairs, while the merus, carpus and chela moreover are provided with spinules, which are placed in more or less distinct longitudinal rows. The second cheliped of the females and the younger males most resembles the smaller second leg of the adult male. In the young specimens only one or two proximal small teeth are visible on the cutting edge,

in larger specimens this number gradually increases, also the spinulation of the second legs is less distinct or even fails entirely in young specimens. The third pereiopod of the adult male (fig. 28 b) reaches with part of the dactylus beyond the scaphocerite, while the fifth pereiopod just fails to reach the end of that scale. The propodus of the third leg is slightly less than 4 times as long as the dactylus. The posterior margin of the propodus bears a number of spinules. The carpus measures $^3/_5$ of the length of the propodus. The merus is slightly longer and distinctly broader than the propodus. The ischium is about half as long as the propodus. All joints are provided with scattered stiff long hairs, while the merus in the adult male moreover is provided at its posterior surface with numerous small spinules. The fifth pereiopod has the propodus slightly less than 4 times as long as the dactylus, here too the posterior margin is provided with spines, while the usual transverse rows of hairs are present in the distal part of the posterior margin. The carpus measures $^1/_2$ to $^3/_5$ of the length of the propodus. The merus is as long as, but distinctly broader than the propodus. The ischium is about half as long as the merus. All joints are smooth and provided with scattered long stiff hairs. In the females and the young males the third leg fails to reach the end of the scaphocerite, while the fifth just attains or just fails to reach the tip of the scale. The propodus of the third leg is slightly less than thrice as long as the dactylus. In very young specimens the propodus of the fifth leg too is relatively shorter.

The pleopods are typical in shape. The endopod of the first pleopods in the males is ovate, with the inner margin concave.

The uropods are longer than the telson. The exopod has the outer margin convex and ending into a tooth, which bears a movable spine at its inner margin.

The eggs are numerous and small, their diameter is about 0.4-0.5 mm.

I have at my disposal specimens of the present species varying in size between 12 and 105 mm. The very young specimens differ from the larger in the following respects:

1. the rostrum in young specimens is relatively much longer. In very young specimens (up to about 20 mm) the tip is entirely styliform (fig. 29 a), while in larger individuals small subapical teeth are visible (fig. 29 b), which in half grown and adult specimens are very distinct (fig. 30 a).
2. in very young specimens (less than 20 mm) the hepatic spine is situated on the anterior margin of the carapace, in larger specimens (20-30 mm) it becomes more remote from that margin, in specimens of more than 30 mm size it finally reaches its characteristic place obliquely behind the antennal spine (figs. 29 c-e). *Leander lepidus* De Man has been described after specimens in which the hepatic spine is still situated close to the anterior margin of the carapace and therefore was taken by De Man to be a branchiostegal spine, which was his reason to insert the specimens in the genus *Leander* auct. The fine series of specimens of various sizes at my disposal shows the real nature of this spine.
3. In specimens of less than 20 mm length a blunt supraorbital tubercle is visible, this probably is the last trace of the supraorbital spine of the larva. In larger stages the tubercle disappears.
4. In young specimens the sixth abdominal segment is more elongate than in older specimens.
5. The mandible in very young specimens (less than 20 mm) has the palp not yet developed, it then consists of only one small joint (fig. 29 f). In older specimens the palp is distinctly three-jointed (fig. 30b).
6. In young and very young specimens the second legs are smooth (figs. 29 h, 30 d), while they are distinctly tuberculate in larger specimens.

7. A very strange feature moreover is shown by the very young specimens (less than 20 mm). Here namely the dactylus of the last three pereiopods is distinctly biunguiculate (figs. 29 i, k), the additional claw disappears gradually in the older forms. (A similar feature is shown by the young specimens

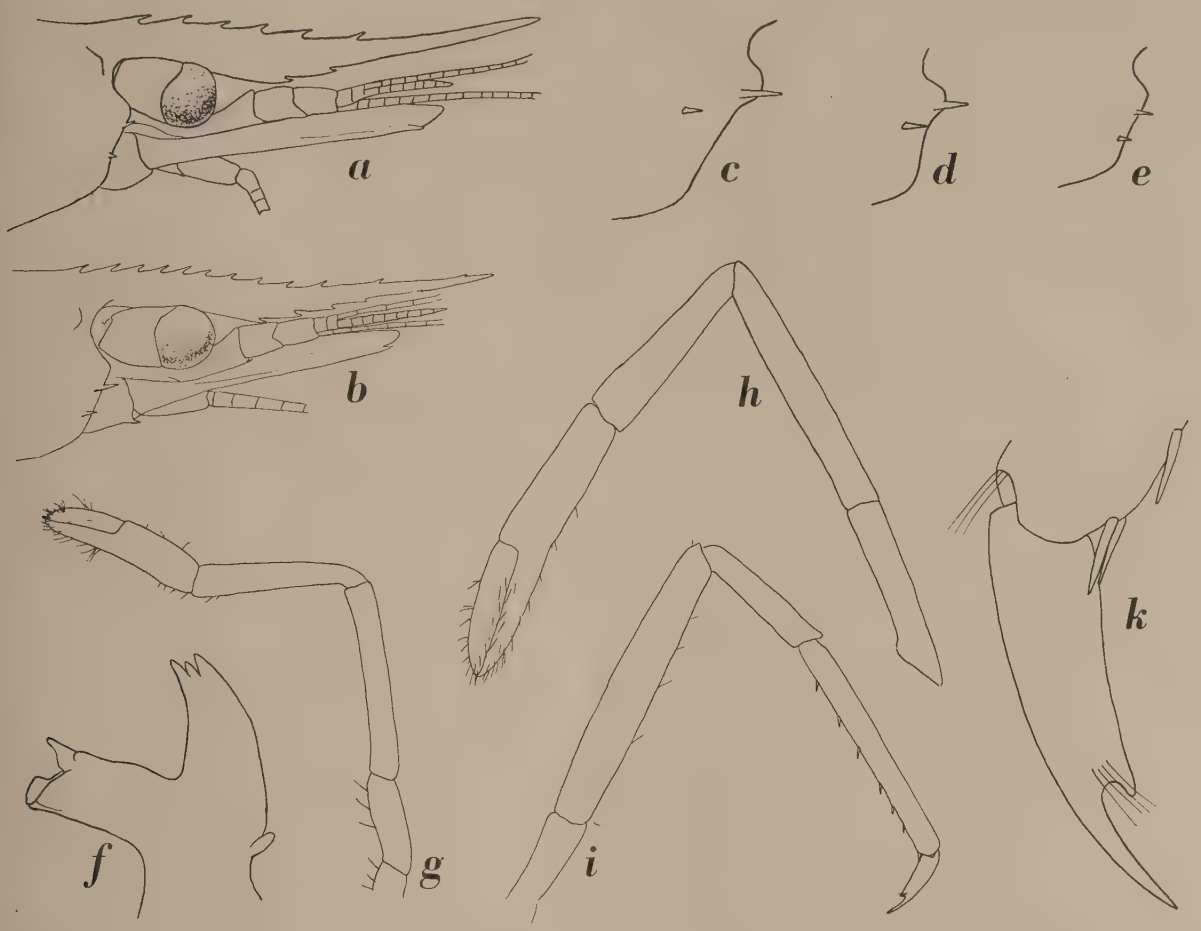

Fig. 29. *Macrobrachium australe* (Guérin), "*dionyx*" stage. a, b, anterior part of body in lateral view; c, d, e, position of hepatic spine in specimens of various size (c = 30 mm, d = 24 mm, e = 20 mm in length); f, mandible; g, first pereiopod; h, second pereiopod; i, third pereiopod; k, dactylus of third pereiopod. a-e, × 13; f, × 66; g-i, × 28; k, × 130.

of *Macrobrachium lar*; here the very young stages have been described as a separate species "*Leander dionyx* Nobili".)

The present species is best known under the name *Palaemon dispar* Von Martens. Before Von Martens published his description, however, the species had already been described twice. *Palaemon sundaicus* of Heller (1862) namely is identical with Von Martens's species. Heller's description gives no certainty about the identity of his species, but in the figure of the second leg numerous denticles are shown on the cutting edges of both fingers, which makes the identity with *Palaemon dispar* certain. De Man (1892, p. 437 footnote) publishes some additional details about the typespecimens of Heller's species, which he received from Dr. Koelbel, the then curator of the Vienna Museum. It is probable that the largest typespecimen of *Palaemon sundaicus*

is missing as according to H e l l e r a specimen of 75 mm length was present among the type material, while K o e l b e l found the largest specimen from the type set to be 50 mm. In all probability the second leg figured by H e l l e r is of the largest specimen, because K o e l b e l found only one specimen with a second leg. This leg shows 4 denticles in the proximal part of the cutting edge of the dactylus and 3 on that of the fixed finger; the leg obviously belongs to a young specimen as it measured only 29.5 mm; this also explains the small number of denticles on the cutting edges. The number of three and four denticles on the cutting edges of the fingers also proves the identity of the species, in the related species namely this number is never more than one or two (for instance in *Macrobrachium equidens* = *Palaemon sundaicus* auct., non Heller). *Palaemon sundaicus* Heller

Fig. 30. *Macrobrachium australe* (Guérin) "*lepidus*" stage. a, anterior part of body in lateral view; b, mandible; c, first pereiopod; d, second pereiopod; e, fingers of second pereiopod; f, third pereiopod. a, × 10; b, × 33; c, d, f, × 14; e, × 66.

therefore is different from the species to which this name generally is given, and is identical with *Palaemon dispar* Von Martens. This possibility has already been pointed at by D e M a n, 1897, p. 781 and K e m p, 1918, p. 263, who, however, thought the changing of the names very undesirable.

G u é r i n M é n e v i l l e (1838) in the zoological part of the results of D u p e r r e y's voyage around the world described a new species, *Palaemon australis* from Tahiti. The species is described by G u é r i n as follows:

"*P.[alaemon] rostro ferè eâdem longitudine quam testâ, subascendente, suprà duodecim dentato, spinis lateralibus thoracis per seriem ordine digestis.* Il est long de près de six décimètres, depuis le bout du rostre jusqu'à l'extrémité de la queue; son rostre a presque la longueur de la carapace; il est un peu relevé en avant, armé de douze dents distribuées à des distances presque égales dans toute sa longueur et en dessus, et en ayant quatre en dessous. Son thorax est lisse, arrondi, sans carènes ni sillons; le bord antérieur est armé d'une épine aiguë, dirigée en avant; on en aperçoit une autre en

arrière de celle-là, placée sur la même ligne, et non plus bas, comme chez les espèces européennes. Les filets des antennes sont très-longs, minces; l'écaille des antennes externes est plus courte que le rostre et n'atteint qu'à la hauteur de sa quatrième dent du dessous. L'abdomen est lisse; ses derniers segments n'ont pas de sillon en dessus. Les lames caudales sont plus longues que l'intermédiaire, ciliées au bord. Les pattes sont toutes grêles, de forme ordinaire."

The description in all respects agrees with *Palaemon dispar* Von Martens, especially in the upward curved part of the rostrum and the dentition of that organ. The statement that the specimen is 6 decimeters long of course is an error and has to be 6 centimeters; the same error namely is made with *Hippolyte Leachii* (= *Saron marmoratus*) described on the same page, here too the length is given in decimeters instead of in centimeters. That *Palaemon australis* really is identical with *Palaemon dispar* is confirmed by the fact that in eastern Polynesia only four species of *Macrobrachium* occur, namely *Macrobrachium dispar, M. lar, M. latimanus* and *M. aemulum,* while Guérin's description does not fit for the latter three species. Furthermore *Palaemon dispar* seems to be very common on Tahiti, as Nobili (1907) states of that species: "Questa specie fu raccolta ..... in grande abbondanza nelle riviere di Tahiti." The use of the name *australe* for the present species therefore is entirely justified, the more as the use of the name *sundaicus* Heller will cause an enormous confusion, because that name is used by most authors for a very common and largely distributed species, which shows much resemblance to the present species, and the range of distribution of which for a large part coincides with that of *P. dispar.* The name *Palaemon australis* has been given by Ortmann (1891), who like almost all other carcinologists evidently was ignorant of the existence of the name *Palaemon australis* Guérin, to an Australian species, which therefore needs a new name, for which I propose here the name *Macrobrachium australiense* nom. nov.

Heller (1865) described and figured under the name *Palaemon Danae* a specimen of *Macrobrachium* from Sydney, which in the shape of the rostrum and the place of the branchiostegal spine closely resembles *Macrobrachium australe.* Also the relation between the joints of the second leg are like those in a young specimen of that species; that Heller's specimen in all probability is not yet fullgrown is shown by the smoothness and the shortness of the second chelae. Final certainty about the identity of *Palaemon danae* with *Macrobrachium australe* is given by the notes of Koelbel (in De Man, 1892, p. 438 footnote) on the type specimen of Heller's species: "Was die Bezahnung der Finger [of the second leg] anbelangt, so muss ich noch bemerken, dass der Dactylus auf seinem Innenrande in der Nähe des Gelenkes fünf Zähne trägt." This now finally settles the question about the identity of *P. danae* as only *Macrobrachium australe* shows the combination of the character of having more than two teeth on the cutting edge of the dactylus of the second legs and the other characters known of *Palaemon danae.* The record of *Palaemon danae* by Haswell (1882) is based on that of Heller (1865). The identity of Ortmann's specimens identified by him with *Palaemon danae* can not be made out with certainty as this author gives too little details of his material. Coutière (1901) refers some specimens from Madagascar to Heller's species, his identification is correct as his material proves to consist of juvenile specimens of *Macrobrachium australe* as is distinctly shown by his description and figures. The specimens identified by Nobili (1903) with *Palaemon danae* are considered by Henderson & Matthai to belong to *"Palaemon" malcolmsonii,* but I find too little data in Nobili's description to make this supposition certain. De Man (1908) described a species, which he provisionally identified with *Palaemon danae*; this species, however, is quite distinct from Heller's form and is, as far as I know, not described

before; therefore the name *novae-hollandiae* proposed by De Man for it in case it should prove to be different from *P. danae*, must be used. The paper in which Rick (1942) mentions "*Palaemon danae*" from Queensland is not at my disposal, so that I do not know the real identity of his material.

Palaemon alphonsianus Hoffmann (1874) belongs, as is clearly shown by Hoffmann's figure, to the present species, to which *Palaemon parvus* of the same author probably belongs too. *P. parvus* namely, concluding from the shape of the rostrum and the second legs, is a young specimen of either *Macrobrachium australe* or *M. equidens*; the position of the hepatic spine, which in Hoffmann's figure is placed much below the antennal, makes the identity of *P. parvus* with *M. australe* almost certain. It is to be regretted that the type specimens of both *Palaemon alphonsianus* and *P. parvus* are no longer extant in the collection of the Rijksmuseum van Natuurlijke Historie at Leiden, where all material dealt with by Hoffmann is preserved.

Palaemon Malliardi Richters (1880) (spelled *Palaemon Maillardi* by Coutière, 1901, p. 329) also belongs to the present species as is distinctly shown by Richter's figure and description. Ortmann (1891) and Coutière (1901) already pointed to this fact.

A further synonym of *Macrobrachium australe* is *Palaemon ustulatus* of Nobili (1899). As De Man (1915) already pointed out the only difference between Nobili's type specimens, which could be examined by De Man, and *P. dispar* was the fact that the specimens of *P. ustulatus* had a blackish colour, but this colour is of no specific value as it was found also in specimens of other species and probably is caused by an external factor.

As already pointed out above, *Leander lepidus* De Man (1915) is nothing else but a young stage of the present species, in which the hepatic spine has not yet attained its typical place. In some of the specimens the denticulation of the fingers of the second chela is already visible.

The specimens of the Leiden and Amsterdam Museums collected by M. Weber and A. Wichmann from Celebes and the Lesser Sunda Islands have already been dealt with by De Man (1892), the specimens from Flores collected by H. ten Kate (Museum Leiden) have already been reported upon by the same author (De Man, 1893), who (De Man, 1915) also dealt with the specimens collected by K. Gjellerup from N. New Guinea (Museum Leiden); the specimen from Amboina (Museum Amsterdam) is treated by De Man (1888). The specimens from Sumba (Museum Amsterdam) were reported upon by J. Roux (1928), those from Tubah River, Ceram and the male from Waigeo by J. Roux (1923) and those from New Guinea (Museum Amsterdam) by J. Roux (1917) under the name *Palaemon* (*Eupalaemon*) *dispar*. The ovigerous females from Waigeo were identified by J. Roux (1923) as *Palaemon sundaicus* (= *Macrobrachium equidens*). The position of the hepatic spine, however, showed the identity of these specimens with the present species; the second pereiopods are lacking in these specimens. The specimens from the rivulet near Keratu, W. Ceram (Museum Amsterdam) too were identified by J. Roux (1923) as *Palaemon* (*Eupalaemon*) *sundaicus*, here too the position of the hepatic spine showed the real identity, while moreover one of the specimens has the cutting edges of fingers of the second leg provided with the large number of denticles, characteristic for *M. australe*.

Distribution. This freshwater species is recorded in literature from: Silhouette Island, Seychelles (Borradaile, 1907), Fali Island, N. W. Madagascar (Hoffmann, 1874), Mananara River, bay of Antongil, N.E. Madagascar (Coutière, 1900, 1901; Lenz, 1910), Sainte Marie Island, E. Madagascar (Coutière, 1900, 1901), Tamatave, E. Madagascar (Lenz, 1910), Réunion

(Hoffmann, 1874), Marsouins River, Saint Benoît, rivulet near Saint Benoît and Étang du Gol, Réunion (J. Roux, 1934), Black River, W. Mauritius and Creoles River, E. Mauritius (Richters, 1880), Bambous, Mauritius (Ward, 1942), Rodriguez (Miers, 1879, 1880), ? Pondicherry (Nobili, 1903), ? Calcutta (Henderson, 1893), Lolomboli, near Gunungsitoli, Nias (Nobili, 1900), Buabua, Enggano, off W. Sumatra (Nobili, 1900), Semangka Bay, S. Sumatra (Miers, 1880), Java (Heller, 1862, 1865; Koningsberger, 1913), Bali (J. Roux, 1930), Lombok (J. Roux, 1930), Pajeti and Karoni, Sumba (J. Roux, 1928a), Rivers near Berit, near Reo and near Raka-mbaha, Flores (De Man, 1892), Ba and Dona Rivers near Ende, Flores (De Man, 1892), Maumere, Flores (De Man, 1893), Besar Island (= Groot Bastaard), off N.E. Flores (De Man, 1893), Nargi River near Konga, E. Flores (De Man, 1892), Adonara Island, E. of Flores (Von Martens, 1868), Tanamerah, Adonara Island, E. of Flores (De Man, 1892), Koinino River near Kupang, Timor (De Man, 1892), North Celebes (Thallwitz, 1892), Menado, N. Celebes (Schenkel, 1902), Lolak River, E. of Menado, N. Celebes (Schenkel, 1902), Enrekang, S.W. Central Celebes (Schenkel, 1902), River near Parepare, S.W. Celebes (De Man, 1892), Tjenrana River near Pampanua, S.W. Celebes (De Man, 1892), Bonea River, Salajar (De Man, 1892), N. Halmahera (De Man, 1902), Oba, Halmahera (De Man, 1902), Ternate (De Man, 1902), Kajeli, Buru (J. Roux, 1928a), Tuba River and rivulet near Keratu, Ceram (J. Roux, 1923), Amboina (De Man, 1888; Ortmann, 1894), between Warkar and Waor, Groot Kai, Kai Islands (J. Roux, 1919), Enralang, Groot Kai, Kai Islands (J. Roux, 1919), Waiho, Wai La and Wai Meniel Rivers, Waigeo (J. Roux, 1923), Sorong, Doom Island, N.W. New Guinea (J. Roux, 1933), Etna Bay, S.W. New Guinea (Holthuis, 1949), between Walckenaer and Tanamerah Bays, N. New Guinea (De Man, 1915), Klipong River, E. of Tanahmerah Bay, N. New Guinea (J. Roux, 1917), Moso River, N. New Guinea, near the frontier with Papua (J. Roux, 1917), Oinaké River, N. New Guinea (De Man, 1915), Rigo, near Port Moresby, Papua (Nobili, 1899), Poulos and Metavoi, New Hanover (J. Roux, 1934a), Beilifu and near Medina, New Ireland (J. Roux, 1934a), Sydney (Heller, 1865), ? Marshall Islands (Ortmann, 1891), Samoa (Miers, 1880), Tahiti (Guérin, 1838), Faarapa and Vaituoru Papenoo Rivers, Tahiti (Nobili, 1907), Omoa Valley, Fatuhiva, Marquesas Group (Adamson, 1935), Vaitumata Valley, Hivaoa, Marquesas Group (Adamson, 1935), Hakahetau Valley, Uapou, Marquesas Group (Adamson, 1935).

Macrobrachium aemulum (Nobili)

Palaemon (*Parapalaemon*) *aemulus* Nobili, 1906a, Bull. Mus. Hist. nat. Paris, vol. 12, p. 258.

Palaemon (*Parapalaemon*) *aemulus* Nobili, 1907, Mem. Accad. Sci. Torino, ser. 2 vol. 57, p. 362, pl. 1 fig. 5.

Palaemon nobilii Henderson & Matthai, 1910, Rec. Indian Mus., vol. 5, p. 295, pl. 17 fig. 6.

Palaemon (*Parapalaemon*) *aemulus* J. Roux, 1926, Nova Caledonia, Zool., vol. 4 pt. 2, p. 221, figs. 47-51.

non *Palaemon* (*Paralaemon*) *aemulus* Boone, 1935, Bull. Vanderbilt mar. Mus., vol. 6, p. 157, pl. 40.

The present species of which no material is at my disposal, is characterized by the slender second legs, which have the carpus distinctly longer than the merus, by the short rostrum, which has the first four or five teeth placed behind the posterior orbital margin and by the large chelae of the males, which have the fingers provided with two or three teeth in the proximal part of the cutting edges.

The species was described first by Nobili (1906a, 1907), while Roux (1926) gave additional details. Henderson and Matthai (1910) described a new species of *Palaemon* from South India, which in all respects agrees with Nobili's species, which is known from New Caledonia and the Tuamotu Islands. The size of the specimens is the same (those of Nobili are: ♂ 64 mm, ♀ 58 mm; those of Henderson & Matthai: ♂ 64 mm, ♀ 54.5 mm; according to J. Roux the species may attain a size of 82 mm). The rostral formula according to J. Roux is $\frac{4\text{-}5)\ 10\text{-}13}{1\text{-}3}$, the specimens of Henderson & Matthai have the formula $\frac{4\text{-}5)\ 10\text{-}12}{2}$, the rostrum in *aemulus* as well as in *nobilii* does not reach beyond the end of the antennular peduncle. The relations between the joints of the second leg agree also in the two forms, only the larger chelipede in Henderson & Matthai's male seems to be less developed than in the males of about the same size in J. Roux's and Nobili's material; the relation between the lengths of the joints in Henderson & Matthai's male specimen perfectly agrees with that of the male specimen of 65 mm from Plaine des Lacs mentioned by Roux. The two forms therefore can not be kept separate and are considered here to belong to one species, which of course has to bear the name *Macrobrachium aemulum* (Nobili).

The specimen referred by Boone (1935) to the present species certainly is no *Macrobrachium aemulum*, but belongs to *Macrobrachium novae-hollandiae* (De Man).

Distribution: This freshwater species is recorded in literature from: Walajabad, Chingleput District, S.E. India (Henderson & Matthai, 1910), numerous localities in New Caledonia (J. Roux, 1926), Gavatake, Tuamotu Islands (Nobili, 1906a, 1907).

Macrobrachium naso (Kemp)

Palaemon naso Kemp, 1918, Rec. Indian Mus., vol. 14, p. 91, pl. 25 figs. 1-5.

The position of this species is still somewhat dubious, as it is based on material in which no ovigerous females were present and in which the males never had the chelae longer than the body, though the appendix masculina was well developed. We therefore still are ignorant if the specimens described by Kemp have attained their final shape or that they are not yet fullgrown. I provisionally follow Kemp in considering the specimens to be adult. No material of the species is at my disposal.

The species is only known from the region of Inlé Lake, Central Burma.

Macrobrachium palaemonoides nov. spec. (fig. 31)

Museum Leiden

Laut Tawar, Laulo Lake, N. Simalur, off Westcoast of Sumatra; fresh water; August, 1913; leg. E. Jacobson; cotypes. — 63 specimens (including 2 ovigerous females) 9-30 mm.

The rostrum (fig. 31a) is elongate and slender, it reaches with up to $^1/_5$ of its length beyond the scaphocerite. The distal half of the rostrum is curved upwards. The upper margin bears 5 to 7 teeth, the two subapical teeth not included. 1 or 2 of the proximal dorsal teeth are placed on the carapace behind the posterior margin of the orbit, the teeth are regularly divided over the proximal half of the upper margin of the rostrum, while there is a large gap between the last of these proximal teeth and the first subapical tooth; in some specimens the last proximal tooth is situated more anteriorly, sometimes even so far, that it divides the distance between the first subapical tooth and

the penultimate proximal tooth into two equal parts, which are of course much larger than the distances between the proximal teeth mutually. Two small subapical teeth are present on the dorsal margin of the rostrum. The lower margin bears 6 to 9, generally 7 or 8, teeth, which are regularly divided over the distal part of the lower margin. The carapace is smooth and shining. The antennal spine is placed somewhat below the rounded lower orbital angle. The hepatic spine is about as strong as the antennal and is placed much below and behind it. The branchiostegal groove is sharply defined, it commences at the anterior margin of the carapace, then it runs backwards closely below the hepatic spine and continues some distance behind that spine, curving at last ventrally and then it gradually disappears: in this respect *M. palaemonoides* differs from all other species examined by me, as in the latter the branchiostegal groove runs straight towards the hepatic spine and can not be seen continuing behind that spine.

The abdomen is smooth. All segments have the tips of the pleurae rounded. The sixth abdominal segment is elongate, it is twice as long as the fifth.

The telson is as long as or slightly shorter than the sixth abdominal segment. The dorsal surface bears the usual two pairs of spines in the middle and at $^3/_4$ of its length. The posterior margin of the telson ends in a sharp and elongate median point, which is flanked at each side by two spines, the inner of which is very long and slender, with the tip curved somewhat outwards and far overreaches the median point of the telson. The outer spines are very short. Between the two inner spines two feathered setae are present.

The eyes are normal, the cornea is about as long as and broader than the stalk. An ocellus is present.

The antennulae are normal in shape too. The anterolateral spine of the basal segment reaches to or slightly beyond the anterior margin of the segment. In older specimens it even is overreached by that margin.

The scaphocerite (fig. 31b) is about thrice as long as broad. The outer margin is straight or somewhat concave. The final tooth is rather strong and is distinctly overreached by the lamella, which is somewhat anteriorly produced.

The oral parts are quite typical and show no differences with those of the other species of *Macrobrachium*.

The first pereiopods (fig. 31c) reach with part of the fingers only beyond the scaphocerite. The chela is rather robust, being slightly broader than the distal part of the carpus. The fingers are as long as or slightly longer than the palm. The carpus is twice as long as the chela and almost 1.5 times as long as the merus. The ischium measures $^2/_3$ of the length of the merus. The second legs (fig. 31d) are smooth and slender, being about as thick as the first legs but longer. They reach with the chela and up to $^1/_3$ of the carpus beyond the scaphocerite. The fingers are distinctly longer than the palm, measuring about $^7/_5$ of its length; both in lateral and in dorsal view the fingers are somewhat narrowed a little distance above the base, and are broadest at $^3/_4$ of their length. The cutting edges of both fingers are entire. The carpus is 1.8 times to twice as long as the chela and about 1.5 times as long as the merus; the ischium is as long as or even slightly longer than the merus. No difference in the shape of the second legs of the males and the females or in the right and left legs could be observed. The last three pereiopods are very long and slender. The third leg (fig. 31e) reaches only with the tip of the dactylus beyond the scaphocerite. The propodus is twice as long as the dactylus, and distinctly less than twice as long as the carpus. The merus is almost as long as the propodus and

the dactylus combined. The ischium is half as long as the merus. The fourth and fifth leg (figs. 31f, g) are conspicuously longer than the third, they reach with half the propodus or more beyond the scaphocerite. In the fifth leg the propodus is fully thrice as long as the dactylus and fully twice as long as the carpus. The merus is slightly shorter than the propodus, while the ischium is about half as long as the merus. The propodi of the last three legs bear the usual posterior spines, while those of

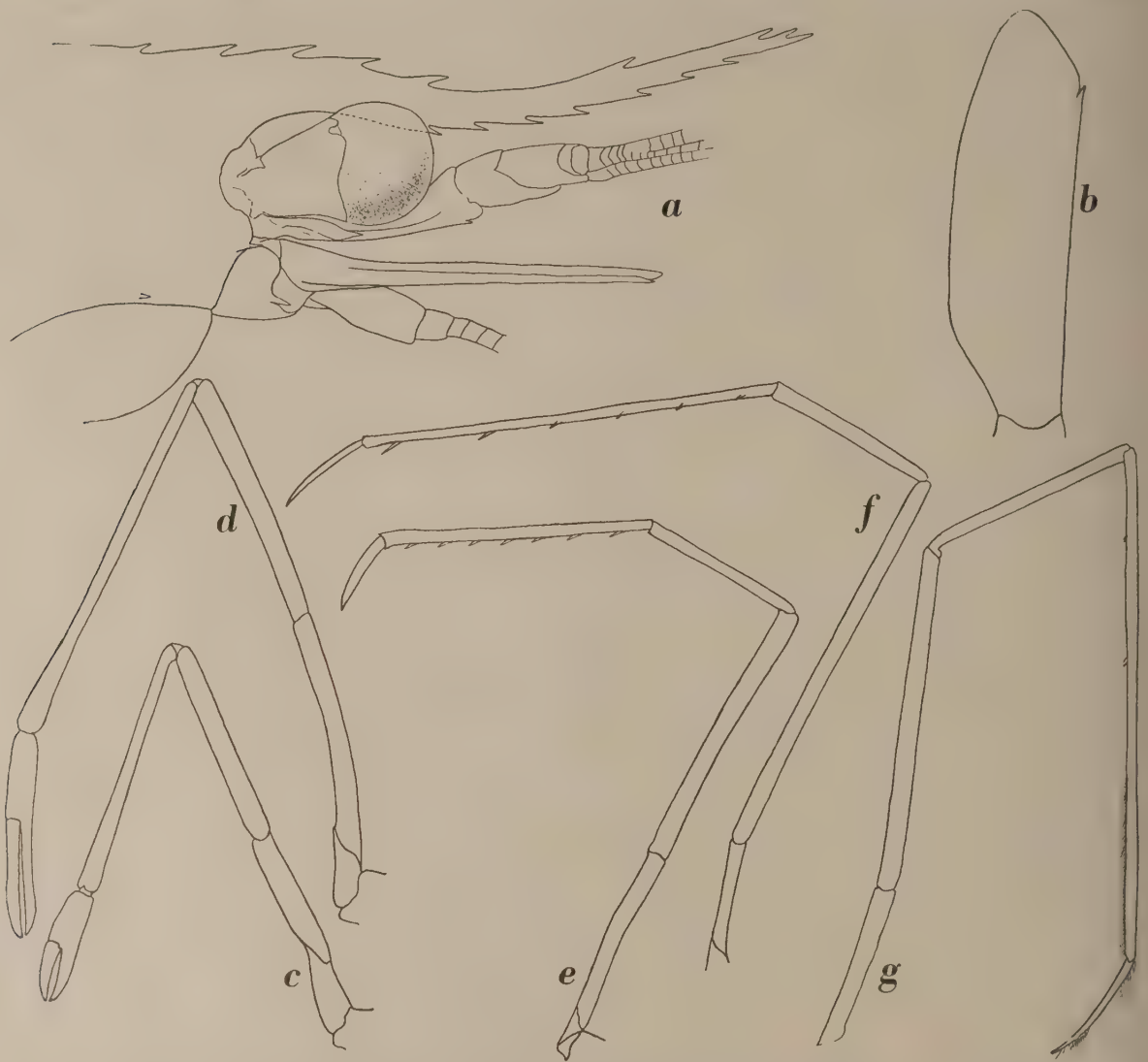

Fig. 31. *Macrobrachium palaemonoides* nov. spec. a, anterior part of body in lateral view; b, scaphocerite; c, first pereiopod; d, second pereiopod; e, third pereiopod; f, fourth pereiopod; g, fifth pereiopod. a-g, × 12.

the fifth legs have the distal transverse rows of hairs, which also are present in the other species of the present genus.

The pleopods are long, but quite normal in shape. In the males the appendix masculina is well developed, it is longer than the appendix interna of the second pleopod. The endopod of the first pleopod of the males is ovate with the inner margin concave and without a trace of an appendix interna.

The uropods reach distinctly beyond the end of the telson, they are elongate and slender, but of the normal construction.

The eggs are rather numerous and large for the small species, they are 0.50 to 0.65 mm in diameter.

In my opinion the present specimens are full grown, though no certainty can be obtained in this respect, as the presence of ovigerous females in the material, though being an indication in favour of my supposition, is no proof of its correctness, because in several species of *Macrobrachium* not full grown females are observed carrying ova.

The present species in all probability is most closely related to *M. lamarrei* and *M. lanchesteri,* with both species it has the slender shape of the body in common, but it may immediately be separated from them by the shape of the rostrum and the last three legs.

Macrobrachium lanchesteri (De Man)

Palaemon paucidens Lanchester, 1901, Proc. zool. Soc. Lond., 1901 pt. 2, p. 568, pl. 33 fig. 4. (non De Haan, 1841).
Palaemon (*Eupalaemon*) *Lanchesteri* De Man, 1911, Notes Leyden Mus., vol. 33, p. 264.
Palaemon lanchesteri Kemp, 1918a, Mem. Asiat. Soc. Bengal, vol. 6, p. 257.
Macrobrachium lanchesteri Suvatti, 1937, Check-List aq. Fauna Siam, p. 49.
Palaemon lanchesteri Tiwari, 1949, Rec. Indian Mus., vol. 45, p. 340.

The present species for the first time was described by Lanchester under the name *Palaemon paucidens,* which name, however, is preoccupied by the names *Palaemon paucidens* De Haan (1841) and *Palaemon paucidens* Hilgendorf (1893a). Therefore De Man (1911) proposed the new name *Palaemon* (*Eupalaemon*) *Lanchesteri* for it. I have seen no material of this species, for the description of which I refer to Lanchester's (1901) and Kemp's (1918a) papers.

Distribution: *Macrobrachium lanchesteri* is known from fresh water in the Malay Peninsula and Siam. Records in literature are: Singgora, Siamese Malay States (Lanchester, 1901), Tale Sap, Siamese Malay States (Kemp, 1918a), Klong Nakorn Noi and Tadi Stream, Ban Ta Yai, Nakorn Sritamarat (Suvatti, 1937), Nong Mong, Krabin, Siam (Suvatti, 1937), Bangkok, Siam (Suvatti, 1937), Nontaburi, Siam (Suvatti, 1937). Tiwari (1949) recorded the species from India (Baroda State and Nagpur).

Macrobrachium superbum (Heller)

Palaemon superbus Heller, 1862a, Verh. zool.-bot. Ges. Wien, vol. 12, p. 528.
Palaemon superbus Heller, 1865, Reise Novara, Zool., vol. 2 pt. 3, p. 118, pl. 10 fig. 10.
Palaemon superbus Ortmann, 1891, Zool. Jb. Syst., vol. 5, p. 713.
non *Palaemon* (*Eupalaemon*) *superbus* Coutière, 1900, C. R. Acad. Sci. Paris, vol. 130, p. 1266.
Palaemon superbus p.p. Coutière, 1901, Ann. Sci. nat. Zool., ser. 8 vol. 12, p. 319, pl. 13 figs. 34, 35 (non 36, 37).
non *Palaemon* (*Eupalaemon*) *superbus* Parisi, 1919, Atti Soc. Ital. Sci. nat., vol. 58, p. 81, pl. 4 fig. 2.
Macrobrachium superbus Gee, 1925, Lingnaam agric. Rev., vol. 3, p. 158.
non *Palaemon superbus* Derjavin, 1930, Hydrobiol. Zeitschr. biol. Wolga Sta., vol. 9, p. 2.
Palaemon superbus Yu, 1931, Bull. Soc. zool. France, vol. 56, p. 269.
non *Palaemon superbus* Buldovsky, 1933, Bull. Far East. Br. Acad. Sci. U.S.S.R., 1933, p. 46, pl. 2 fig. 17.
non *Palaemon superbus* Birstein & Vinogradov, 1934, Zool. Journ. Moscow, vol. 13, p. 43, fig. 1.
non *Palaemon superbus* Birstein, 1939, Zool. Journ. Moscow, vol. 18, p. 55.
non *Palaemon superbus* Birstein, 1941, Life Freshwater U.S.S.R., vol. 1, p. 424.

The synonymy of *Macrobrachium superbum* is very confused. Heller described and figured the species after a specimen from Shanghai. Ortmann (1891) inserted the species in his list, without giving new data. Coutière (1901), who was able to examine Heller's type specimen, identified some specimens from Madagascar with Heller's species. In his paper Coutière gives measurements and figures of both the type specimen and his own material. In my opinion Coutière incorrectly identifies his Madagascar and Zanzibar material with Heller's species. In all Coutière's specimens, according to the description and figures, more than two teeth are present in the proximal part of the cutting edges of the fingers, while in the type of *P. superbus,* which is larger than any of Coutière's specimens, both fingers bear one scarcely visible tooth and Yu (1931) even states of his Chinese material that no teeth are present at all. Furthermore the second legs of *M. superbum* are smooth as is stated by Coutière for the type and by Yu for his Chinese specimens, while Coutière in his other material found "une fine spinulation" on the second legs. Also the difference in length between the carpus and merus of the second leg is much larger in *M. superbum* than in Coutière's Madagascar specimens, while also the fingers of the second leg in *M. superbum* generally are much longer in relation to the palm than those of the specimens of Coutière. In my opinion Coutière's specimens are nothing else but not full grown specimens of *Macrobrachium scabriculum* (Heller) (cf. p. 226).

The specimens described and figured by Parisi (1919) under the name *Palaemon superbus* from S. China, certainly do not belong here, as is already pointed out by Yu (1931, p. 271). In my opinion the specimens are females of *Macrobrachium nipponense* (cf. p. 173).

As is pointed out on p. 196, also the specimens from S.E. Siberia identified by Derjavin (1930), Buldovsky (1933) and Birstein & Vinogradov (1934) with *"Palaemon suberbus",* do not belong to the present species, but in all probability are specimens of *Macrobrachium asperulum* (Von Martens).

Distribution: The only genuine specimens of *Macrobrachium superbum* mentioned in literature are the type recorded by Heller (1862a, 1865) from Shanghai, which also was described and figured by Coutière (1901), and the specimens mentioned by Yu (1931), which originated from Ihing and Soochow. The species thus is only known at present from a very restricted area.

Macrobrachium minutum (J. Roux) (fig. 32)

Palaemon minutus J. Roux, 1917, Nova Guinea, vol. 5, p. 599, pl. 27 figs. 1-3.

Museum Amsterdam

Western part of Sentani Lake, N. New Guinea; April 17, 1903; New Guinea Expedition, 1903; cotypes of *Palaemon minutus* J. Roux. — 5 specimens (included 2 ovigerous females) 29-47 mm.
Sentani Lake, N. New Guinea; June 28, 1903; New Guinea Expedition, 1903; cotype of *Palaemon minutus* Roux. — 1 specimen 27 mm.

The following details may be added to Roux's description:

The third tooth of the rostrum (fig. 32a) often is placed just over the posterior limit of the orbit. The hepatic spine is placed obliquely behind the antennal, the direction of the hepatic spine lies in the same line as that of the antennal.

In contradistinction to Roux's description I find the surface of the abdomen and telson perfectly smooth. The sixth abdominal segment is about 1.5 times as long as the fifth. The pleurae of the fifth segment are rather acutely pointed.

The telson is somewhat longer than the sixth abdominal segment. The dorsal spines are placed as usual in the middle and at $^3/_4$ of the length of the telson. The posterior margin of the telson ends in a sharp median point, which is flanked with the common two pairs of spines, the inner of

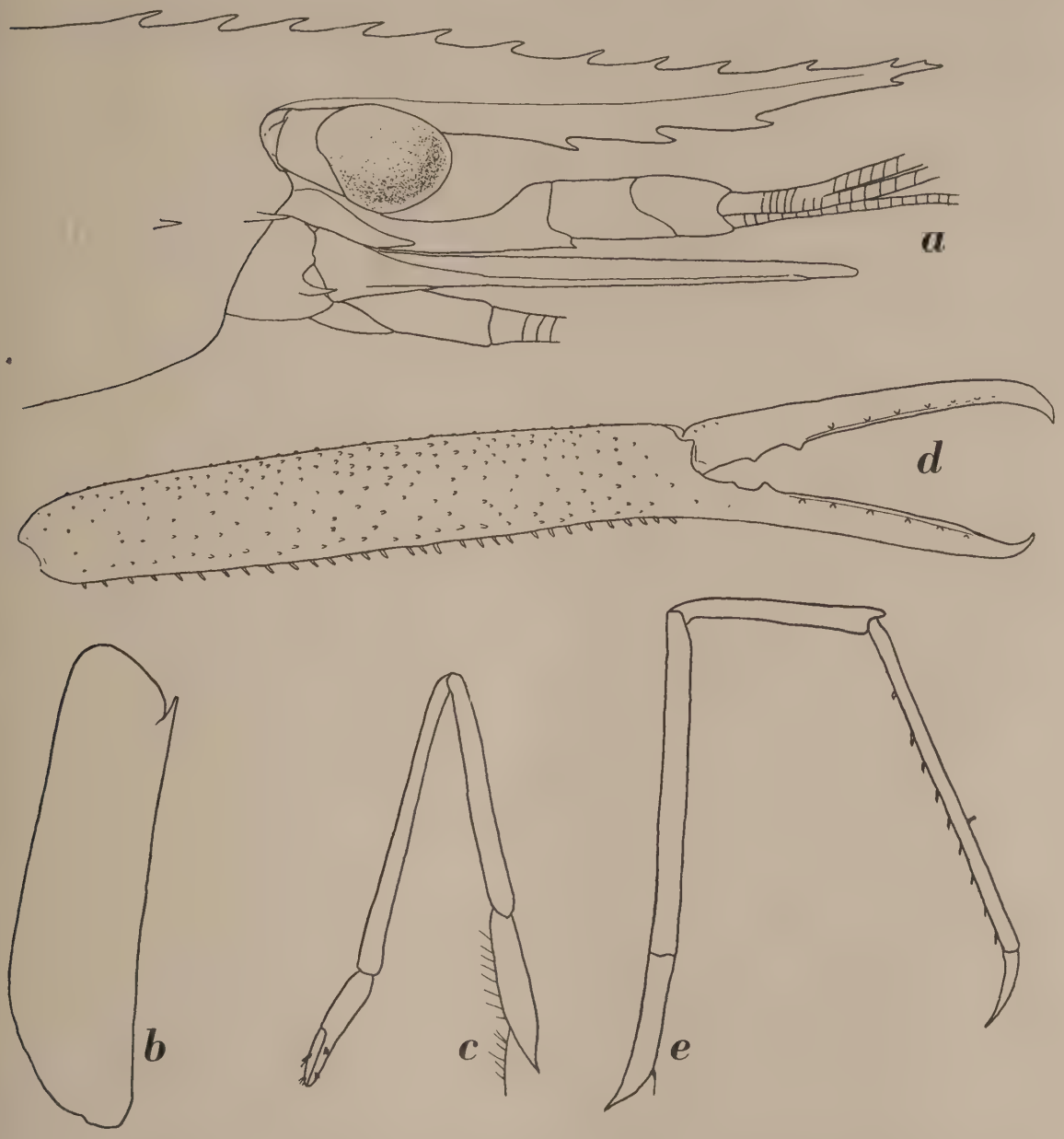

Fig. 32. *Macrobrachium minutum* (J. Roux). a, anterior part of body in lateral view; b, scaphocerite; c, first pereiopod; d, chela of second pereiopod; e, third pereiopod. a-e, × 10.

which is longest and reaches distinctly beyond the apex of the telson, between these two inner spines some 5 feathered setae are present.

The eyes are large, with the cornea slightly shorter and distinctly broader than the stalk. An ocellus is present.

The antennular peduncle is quite typical in shape.

The scaphocerite (fig. 32b) has the outer margin somewhat concave, the final tooth is strong, but it is distinctly overreached by the lamella.

The oral parts are quite typical.

The first pereiopods (fig. 32c) reach with the entire chela beyond the scaphocerite. The fingers are about as long as the palm. The carpus is twice as long as the chela, the merus is $^{1}/_{5}$ of the length of the carpus. The ischium is about half as long as the carpus. In one of the large chelae of the second leg of the male the fingers are $^{2}/_{3}$ as long as the palm, while in the other they are slightly more than half as long as the palm. In the larger chela at my disposal (fig. 32d) at both sides of the cutting edges of the fixed finger and of the dactylus a row of distinct blunt tubercles is visible. In the leg figured by R o u x, which is smaller than the just mentioned pereiopod, these tubercles are few in number and not very distinct. The last three legs are slender, they reach with about half the propodus beyond the scaphocerite. In most specimens the last three pereiopods are more or less damaged. In none of the specimens the dactylus of the third leg is present. The propodus of the third pereiopod (fig. 32e) has the posterior margin provided with about ten rather small spinules. The carpus is distinctly more than half as long as the propodus. The merus is slightly shorter than the propodus, the ischium is about half as long as the merus. The fifth pereiopod is much more slender than the third. The dactylus is elongate. The propodus is about five times (not 10 times as stated by R o u x) as long as the dactylus, it is very narrow and bears some very small spinules along the posterior margin, which in the distal part bears the usual transverse rows of setae. The carpus is slender too, measuring slightly more than half the length of the merus. The merus is almost as long as the propodus, but is stronger. The ischium is less than half as long as the merus.

The endopod of the first pleopod of the male is typical in shape, it is elongate ovate, with the inner margin concave. The other pleopods too do not differ from the usual type.

The uropods are elongate, their shape is normal.

As already remarked by J. Roux, the present species, by the presence of the very long carpus in the second leg of the adult males belongs to the group of *Macrobrachium idae*. From both *Macrobrachium idae* and *M. idella* it may be distinguished at once by the presence of tubercles along the cutting edge of the fingers of the large chelae of the adult male; moreover the legs are more slender and the carapace and abdomen of the adult specimens show no tubercles.

Distribution. The species is only known from the specimens dealt with here, which all have been collected in Sentani Lake in N. New Guinea, in fresh water.

Macrobrachium idae (Heller) (fig. 33)

Palaemon Idae Heller, 1862, S. B. Akad. Wiss. Wien, vol. 45 pt. 1, p. 416, pl. 2 figs. 40, 41.
? *Palaemon Idae* Von Martens, 1868, Arch. Naturgesch., vol. 34 pt. 1, p. 39.
Palaemon Idae Hilgendorf, 1869, Von der Decken's Reise O. Afr., vol. 3 pt. 1, p. 102, pl. 6 fig. 5.
? *Palaemon Idae* Von Martens, 1876, Preuss. Exped. Ost Asien, Zool., vol. 1, p. 199.
Palaemon Idae Richters, 1880, Beitr. Meeresf. Maur. Seych., p. 166.
Palaemon idae Ortmann, 1891, Zool. Jb. Syst., vol. 5, p. 717.
Palaemon Idae Koelbel, 1892, in De Man, Weber's Zool. Ergebn., vol. 2, p. 437 footnote.
Palaemon cf. *idae* Ortmann, 1894, Denkschr. med-naturw. Ges. Jena, vol. 8, p. 18.
Palaemon (*Eupalaemon*) *idae* De Man, 1897, Zool. Jb. Syst., vol. 9, p. 767.
Palaemon (*Eupalaemon*) *ritsemae* De Man, 1897, Zool. Jb. Syst., vol. 9, p. 774.
Palaemon (*Eupalaemon*) *ritsemae* De Man, 1898, Zool. Jb. Syst., vol. 10, p. 707, pl. 37 fig. 70.
Palaemon (*Eupalaemon*) *idae* Hilgendorf, 1898, Deutsch O. Afrika, vol. 4 pt. 7, p. 28.

Palaemon (*Eupalaemon*)*Idae subinermis* Nobili, 1899, Ann. Mus. Stor. nat. Genova, vol. 40, p. 237.
Palaemon (*Eupalaemon*) *Mariae* Coutière, 1900, C. R. Acad. Sci. Paris, vol. 130, p. 1266.
Palaemon (*Eupalaemon*) *Ritsemae* Coutière, 1900, C. R. Acad. Sci. Paris, vol. 130, p. 1266.
Palaemon (*Eupalaemon*) *Idae* Coutière, 1900, C. R. Acad. Sci. Paris, vol. 130, p. 1266.
Palaemon (*Eupalaemon*) *Mariae* Coutière, 1900a, Bull. Mus. Hist. nat. Paris, vol. 6, p. 24.
Palaemon (*Eupalaemon*) *Idae* Nobili, 1900, Ann. Mus. Stor. nat. Genova, vol. 40, p. 480.
Palaemon (*Eupalaemon*) *Idae* Coutière, 1901, Ann. Sci. nat. Zool., ser. 8 vol. 12, p. 303, pl. 12 figs. 29-31.
Palaemon Idae inermis Coutière, 1901, Ann. Sci. nat. Zool., ser. 8 vol. 12, pp. 304, 306.
Palaemon Ritsemae Coutière, 1901, Ann. Sci. nat. Zool., ser. 8 vol. 12, p. 314, pl. 13 figs. 32, 33.
Palaemon (*Eupalaemon*) *robustus* De Man, 1902, Abh. Senckenb. naturf. Ges., vol. 25, p. 771, pl. 24 fig. 48.
Palaemon (*Eupalaemon*) *idae* Lenz, 1905, Abh. Senckenb. naturf. Ges., vol. 27, p. 379.
? *Palaemon Idae* Nobili, 1905a, Ann. Mus. nat. Hung., vol. 3, p. 481.
Palaemon (*Eupalaemon*) *idae* Borradaile, 1907, Trans. Linn. Soc. Lond. Zool., ser. 2 vol. 12, p. 67.
Palaemon (*Eupalaemon*) *ritzemae* Borradaile, 1907, Trans. Linn. Soc. Lond., Zool., ser. 2 vol. 12, p. 67.
non *Palaemon idae* Henderson & Matthai, 1910, Rec. Indian Mus., vol. 5, p. 285, pl. 15 fig. 3, pl. 16 fig. 3.
Palaemon (*Eupalaemon*) *idae* Lenz, 1910, Voeltzkow's Reise O. Afrika, vol. 2, p. 567.
Palaemon (*Eupalaemon*) *ritsemae* Calman, 1913, Proc. zool. Soc. Lond., 1913, p. 927.
? *Palaemon* (*Eupalaemon*) *ritsemae* J. Roux, 1931, Rev. Suisse Zool., vol. 38, p. 43.
Palaemon (*Eupalaemon*) *idae* J. Roux, 1934, Faune Colon. Franç., vol. 5, p. 533.
Palaemon (*Eupalaemon*) *ritsemae* J. Roux, 1934, Faune Colon. Franç., vol. 5, p. 534.
Palaemon (*Eupalaemon*) *cognatus* J. Roux, 1934a, Rev. Suisse Zool., vol. 41, p. 223, figs. 6-8. (non *Palaemon cognatus* J. Roux, 1927).
Palaemon idae Estampador, 1937, Philipp. Journ. Sci., vol. 62, p. 489.
Palaemon idae Panikkar, 1937, Journ. Bombay nat. Hist. Soc., vol. 39, p. 346.
Palaemon idae Nataraj, 1942, Curr. Sci., vol. 11, p. 468.
Palaemon idae Chopra, 1943, Indian Sci. Congr., vol. 30 pt. 2 sect. 6, p. 5.
Palaemon idae Nataraj, 1947, Rec. Indian Mus., vol. 45, p. 89, figs., 1, 2.

Museum Leiden

Java; leg. P. Bleeker. — 2 specimens 63 and 76 mm.

Museum Amsterdam

Atjeh (= Achin); leg. capt. Storm; coll. J. G. de Man; cotypes of *Palaemon ritsemae* De Man. — 2 specimens (1 ovigerous female) 45 and 51 mm.
Java Sea; leg. capt. Storm; coll. J. G. de Man. — 1 specimen 77 mm.

The specimen of the Amsterdam Museum from the Java Sea formed part of the material described by De Man (1897) as *Palaemon idae*. De Man's description is very extensive, while Coutière (1901) also provided important data concerning the present species. The following details, however, may be useful:

The pleurae of the sixth abdominal segment end in a blunt apex. The sixth segment is slightly longer than the fifth and is about $^2/_3$ of the length of the telson. The apex of the telson bears numerous setose hairs, its shape and armament is just like those of the allied species.

The scaphocerite (fig. 33a) is only slightly narrower anteriorly than posteriorly. The outer margin is only faintly convex, the final tooth is small and is overreached by the lamella.

The oral parts are typical.

The pleopods are normal in shape.

The specimens reported upon by Von Martens (1868) under the name *Palaemon Idae* at least partially do not belong to that species. Von Martens's material originated from Java, from Singapore and from the Philippines. The description of the specimens, however, is insufficient for recognizing the species, to which they belong. So for instance Von Martens states that in his specimen from Java, an adult male of 115 mm length, the dactylus of the larger leg bears anteriorly of the large proximal tooth 12 smaller teeth, while in the fixed finger the cutting edge distally of the large tooth is entire. This character certainly is never shown by *M. idae*, while in *M. australe*, which has the cutting edges of the fingers of the large legs provided with many denticles, always both cutting edges are denticulate and never only one; it is possible, however, that the denticles of Von Martens's description are nothing else but tubercles, which are placed alongside the cutting edge. Of the specimen from Singapore Von Martens remarks that it closely resembles *Palaemon*

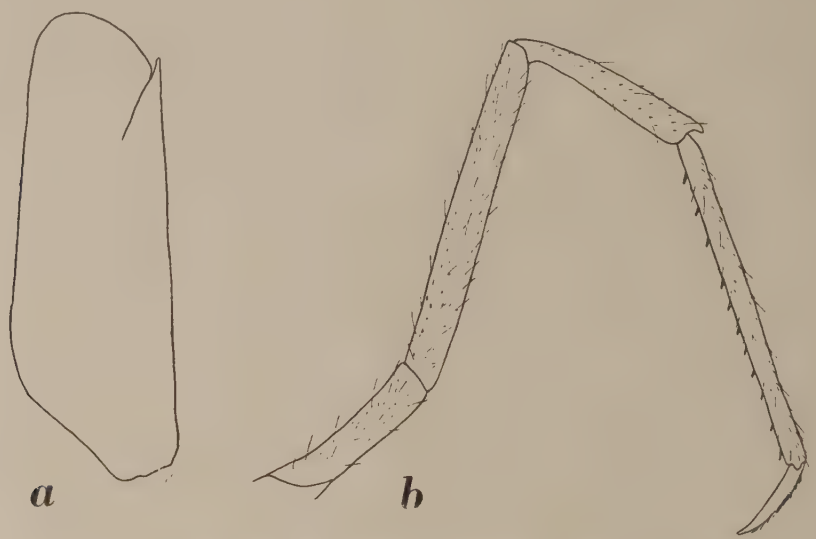

Fig. 33. *Macrobrachium idae* (Heller). a, scaphocerite; b, third leg. a, b, × 5.

equidens Dana; it is of course very well possible that the specimen really belongs to that species, but no certainty can be obtained.

Palaemon ritsemae De Man is based on material of the present species, which contains no adult males, the largest male according to De Man being 45 mm. Some of the females of that lot of specimens were ovigerous, the smallest ovigerous female, however, being 50 mm long. A male and a female specimen of the cotypes of *Palaemon ritsemae* are at my disposal. Comparison of these specimens with specimens of *Macrobrachium idae* at my disposal showed, that the two forms in all respects resemble each other, except for the shape of the second legs. The rostrum of *P. ritsemae* has exactly the same shape as that of *M. idae*, while *P. ritsemae* also has the very slender posterior legs in common with *M. idae* and differs in this respect from allied species as *M. australe* and *M. equidens*. The differences in the relations between the lengths of the joints of the second legs of *Palaemon ritsemae* and *M. idae* are only due to age. Of *M. idae* only large specimens are at my disposal, while in literature too almost exclusively measurements of adult males of *P. idae* are given. Coutière (1901), however, had a rather large material of *P. idae* and *P. ritsemae* at his disposal. His specimens

of *P. idae* generally are larger than those of *P. ritsemae,* at least the second pereiopods of the latter species are shorter (48-100 mm in length) than those of the former species (70-195 mm). The measurements given by Coutière of his material distinctly shows that the two forms are connected by gradual transitions. So in the small specimens of *P. idae* the carpus is only slightly longer than the chela (27 against 25 mm, 28 against 26.5, and 22 against 20 mm), while this also is the case in the larger specimens of *P. ritsemae* (32.5 against 31, 28 against 27.5, 26 against 25 mm). In the larger specimens of *P. idae* the carpus becomes much longer in relation to the chela (71 against 55, and 47 against 39.5 mm), in *P. ritsemae* the carpus becomes slightly shorter than the chela in small specimens (11 against 12, 19 against 21 mm). The relation between the length of the palm and that of the fingers also gradually changes with age, in large *P. idae* the palm is almost or entirely twice as long as the fingers, in smaller specimens it is about 1.5 times as long as the fingers. In large specimens of *P. ritsemae* in Coutière's material this relation is 1.4, in the smaller 1.2. As in all other characters there is the closest resemblance between the two forms, we confidently may accept their identity. This also is confirmed by the fact that Coutière's material of *P. ritsemae* as well as that of *P. idae* originated from the same locality, namely the Ivaloina River on Madagascar. In Calman's (1913) material the same may be found: his smaller specimens entirely agree with those described by Coutière as *P. ritsemae,* while the largest male chelipede in his collection (123 mm long) agrees good with that of the large specimens of *P. idae* of Coutière. Calman already pointed to the large resemblance of his specimens with *P. idae,* but he thinks them nevertheless distinct from that species as the carapace has the surface smooth or provided with "very minute and inconspicuous traces of spinules". Now, as is well known and is pointed out by many authors, the spinulation of the carapace in many species is characteristic for the adult males, sometimes large females bear such spinules too, but they always are absent in young specimens. The time at which the spinulation appears in the males generally is very variable. Probably therefore Calman's specimens were too young to be provided with such spinules. Calman's observations thus confirm my supposition that *P. ritsemae* is nothing else but a juvenile stage of *Macrobrachium idae.* The specimens from S. India mentioned by J. Roux (1931) under the name *Palaemon* (*Eupalaemon*) *ritsemae* probably do not belong to the present species as Roux describes the ultimate portion of the rostrum to be devoid of teeth, which certainly is not the case with either the adult or young specimens of *M. idae,* also the fact that only 6-8 teeth are present on the upper margin of the rostrum is an indication that these specimens belong to another species, but I cannot conclude from Roux's description which species that may be.

Palaemon robustus, a form from Halmahera, described by De Man as a new species also undoubtedly belongs to *Macrobrachium idae.* De Man himself already pointed out that the species shows such a large resemblance to *P. ritsemae,* that it probably had to be considered an older stage of that species, he therefore gave the new name *robustus* only provisionally. The only differences between *P. ritsemae* and *P. robustus* namely are:

1. *P. robustus* is considerably larger than *P. ritsemae.*

2. The second legs of *P. robustus* are much stronger than those of *P. ritsemae.*

3. The movable fingers of the second legs of *P. robustus* are covered with felt-like hairs, which are absent in *P. ritsemae.*

All these three differences are due to the fact that *P. robustus* is an older stage of *P. ritsemae.* Comparing De Man's description and measurements of *P. robustus* with those of Coutière

concerning *P. idae* and *P. ritsemae*, we must come to the conclusion that the three species are identical. The feltlike hairs on the movable finger of the large chela of the adult male and those along the cutting edge of the fixed finger are well shown in older specimens of *Macrobrachium idae*. Also the shape of the rostrum and the elongate last three pereiopods as described for *P. robustus* are characteristic for *M. idae*.

The specimens recorded by Nobili (1905a) from Stephansort and assigned by him to the present species, according to the rostral formula $\frac{1)\ 3+1}{3}$ seem to belong to a different species, but too little characters are given by the Italian author to make the identity of his specimen certain.

In 1927 J. Roux described a new species *Palaemon* (*Eupalaemon*) *cognatus* from the Mamberamo river in Dutch North New Guinea, after a young and imperfect male specimen. The identity of this new species or its place among the other species can not be made out from Roux's description. In 1934 Roux described and figured adult material of a *Macrobrachium* species from Manus, Admiralty Islands as belonging to *Palaemon cognatus*. From this description and the figures it at once is clear that the specimens belong in reality to *Macrobrachium idae*, with which species they agree perfectly in the shape of the rostrum, in the situation of the hepatic and antennal spines in the shape and relation of the lengths of the various joints of the second legs, in the pubescence of the fingers of those legs in the adult male and in the slender last three pairs of pereiopods. I think it very improbable that the type specimen of *P. cognatus* too belongs to *M. idae* as the rostrum is of an entirely different shape. *P. cognatus* must be considered a species incerta.

Distribution: This freshwater species (the only record from salt water is that of De Man, 1897, from the Java Sea) is known from the following localities: Zanzibar (Hilgendorf, 1869), ? Dar-es-Salaam (Ortmann, 1894), Seychelles (Richters, 1880), Côte d'Or, Praslin, Seychelles (Borradaile, 1907), Cascade River, Mahé, Seychelles (Borradaile, 1907), Madagascar (Coutière, 1900, 1901), Majunga, N.W. Madagascar (Lenz, 1905), Fiherenga River near Tulear, S. Madagascar (J. Roux, 1934), Ankarimbela, S. Madagascar (Lenz, 1910), Manambato, N.E. Madagascar (Calman, 1913), Ambilo, E. Madagascar (Calman, 1913), Ivaloina River near Tamatave, E. Madagascar (Coutière, 1900, 1901), Tamatave (Calman, 1913; J. Roux, 1934), Ivondro, E. Madagascar (Calman, 1913), Vatomandry, E. Madagascar (J. Roux, 1934), Mauritius (Richters, 1880), Mudumalai, Mysore Plateau, S. India? (J. Roux, 1931), Pikara River near Teppakadu and Aliyar River near Malayandi Pattanam, S. India? (J. Roux, 1931), Travancore, S. India (Nataraj, 1942, 1947), Singapore? (Von Martens, 1868), Laguna de Bay, Luzon, Philippines? (Von Martens, 1868, 1876), Albay and Camarines Sur, S. Luzon? (Von Martens, 1868), Borneo (Heller, 1862), Atjeh, N. Sumatra (De Man, 1897), Sibolga, westcoast of Sumatra (Nobili, 1900), Java Sea (De Man, 1897), Java? (Von Martens, 1868), Kau and Tobelo, Halmahera (De Man, 1902), Stephansort, N. Papua? (Nobili, 1905a), San Guiseppe River near Innawi, Meheo District, Papua (Nobili, 1899), Buboi, N.E. Manus, Admiralty Islands (J. Roux, 1934a).

Macrobrachium idella (Hilgendorf)

Palaemon mossambicus Pfeffer, 1889, Jb. Hamb. wiss. Anst., vol. 6 pt. 2, p. 34. (non Hilgendorf, 1879).

Palaemon (*Eupalaemon*) *idae idella* Hilgendorf, 1898, Deutsch O. Afrika, vol. 4 pt. 7, p. 29, fig. A.

Palaemon (*Eupalaemon*) *multidens* Coutière, 1900, C. R. Acad. Sci. Paris, vol. 130, p. 1266.
Palaemon (*Eupalaemon*) *multidens* Coutière, 1900a, Bull. Mus. Hist. nat. Paris, vol. 6, p. 23.
Palaemon multidens Coutière, 1901, Ann. Sci. nat. Zool., ser. 8 vol. 12, p. 327, pl. 14 fig. 40.
Palaemon (*Eupalaemon*) *multidens* Nobili, 1903, Boll. Mus. Zool. Anat. comp. Torino, vol. 18 n. 452, p. 9.
Palaemon idae Henderson & Matthai, 1910, Rec. Indian Mus., vol. 5, p. 285, pl. 15 fig. 3, pl. 16 fig. 3.

The present species has been described as *Palaemon multidens* by Coutière (1901) after a juvenile specimen. Henderson & Matthai (1910) gave an extensive description of adult specimens of this species, which they considered to belong to *Macrobrachium idae*. There is indeed a close resemblance between these two forms and perhaps *M. idella* must be considered only a variety of *M. idae* as is done by Hilgendorf. The main difference between the two species is that the rostrum in *M. idae* bears 9 to 11 dorsal teeth of which almost constantly three are placed behind the posterior limit of the orbit, while in *M. idella* the upper margin of the rostrum is provided with 12 to 17 (seldom 11) teeth of which almost constantly only 2 are placed behind the posterior orbital margin. In most other respects there is a close resemblance between the two forms. In adult males of both, the anterior part of the carapace,the abdominal pleurae, the sixth abdominal segment and the dorsal surface of the caudal fan are beset with numerous small tubercles. The shape of the second pereiopods of the adult male of the present species is extensively dealt with by Henderson & Matthai (1910). Comparing the measurements of the second leg of the adult male of this species given by Henderson & Matthai with those of *M. idae* given by other authors, it is distinct that in *M. idella* the carpus of the large second pereiopod in relation to the chela generally is shorter, though in large specimens it becomes longer than the chela too; this feature also is shown by Hilgendorf's specimens. The chela in *M. idella* is more slender than in *M. idae*. According to Hilgendorf the eggs of the present species are large, differing in this respect from those of *M. idae*, Henderson & Matthai do not mention anything about the size of the ova of their material.

Hilgendorf's description and figure of *Palaemon idae* var. *idella* in all respects agrees with Henderson & Matthai's *Palaemon idae*. The only difference is the fact that Hilgendorf's specimens are much smaller than those of the British carcinologists, but the latter authors mention that in their material some specimens were present which were much smaller than the others and nevertheless showed adult characters. Comparison of material from both localities is very desirable.

Hilgendorf pointed out that at least part of the specimens reported upon by Pfeffer (1889) as *Palaemon mossambicus* in reality belongs to the present species.

Distribution: The species lives in fresh water and is recorded in literature from: Pond near Matomondo, Unguu, Tanganyika (Pfeffer, 1889; Hilgendorf, 1898), Uzaramo, Tanganyika (Hilgendorf, 1898), ? Mbusini, Uzeguhu, Rukagura River, Tanganyika (Pfeffer, 1889), arm of Onilahy River, W. Madagascar (Coutière, 1900, 1901), Mangalore, S. Canara District, S.W. India (Henderson & Matthai, 1910), Calicut and Palghat, Malabar District, S.W. India (Henderson & Matthai, 1910), Kottayam, Travancore, S.W. India (Henderson & Matthai, 1910), Koll Lands and Cochin, Cochin State, S.W. India (Henderson & Matthai, 1910), Pondicherry, S.E. India (Nobili, 1903).

Macrobrachium mammillodactylus (Thallwitz) (fig. 34)

Palaemon idae mammillodactylus Thallwitz, 1892, Abh. zool.-anthrop. Mus. Dresden, 1890-1891 pt. 3, p. 15.
Palaemon (*Eupalaemon*) *Wolterstorffi* Nobili, 1900a, Boll. Mus. Zool. Anat. comp. Torino, vol. 15 n. 379, p. 1.
Palaemon (*Eupalaemon*) *wolterstorffi* De Man, 1908a, Ann. Mag. nat. Hist., ser. 8 vol. 1, p. 368.
Palaemon philippinensis Cowles, 1914, Philipp. Journ. Sci., vol. 9 sect. D., p. 340, pl. 2 fig. 2.
Palaemon (*Eupalaemon*) *sundaicus* p.p. J. Roux, 1921, Nova Guinea, vol. 13, p. 590.
Palaemon (*Eupalaemon*) *philippinensis* J. Roux, 1921, Nova Guinea, vol. 13, p. 593.
Palaemon (*Parapalaemon*) *lorentzi* p.p. J. Roux, 1921, Nova Guinea, vol. 13, p. 596.
Palaemon (*Eupalaemon*) *philippinensis* J. Roux, 1923, Capita Zool., vol. 2 pt. 2, p. 5.
Palaemon (*Eupalaemon*) *sundaicus* p.p. J. Roux, 1923, Capita Zool., vol. 2 pt. 2, p. 6.
Palaemon philippinensis Estampador, 1937, Philipp. Journ. Sci., vol. 62, p. 488.
? *Palaemon talaverae* Blanco, 1939, Philipp. Journ. Sci., vol. 69, p. 168, pl. 2.
non *Palaemon philippinensis*, Kubo, 1940, Journ. Imp. Fish. Inst. Tokyo, vol. 34, p. 10, textfigs. 3, 4, pl. 1 fig. d.

Snellius Expedition

Beo, Talaud Islands; fresh water; June 14-21, 1930. — 1 specimen 108 mm.

Museum Amsterdam

Rivulet near Ga, Waigeo; January 4, 1910; leg. L. F. de Beaufort. — 1 specimen 72 mm.
Wai Meniel River, Waigeo; January 5, 1910; leg. L. F. de Beaufort. — 3 specimens 97-137 mm.
Lorentz River, S. W. New Guinea; May 7 and 14, 1907; New Guinea Expedition, 1907. — 21 specimens (included 2 ovigerous females) 44-83 mm (1 specimen bopyrized).
Lorentz River, S. W. New Guinea; September 3, 16 and 20, 1909; leg. H. A. Lorentz; New Guinea Expedition, 1909. — 8 specimens (included 2 ovigerous females) 56-99 mm (1 specimen bopyrized).
Creek near Lorentz River, S. W. New Guinea; May 12 and 14, 1907; New Guinea Expedition, 1907. — 26 specimens (included 1 ovigerous female) 50-93 mm.
Alkmaar, Upper Lorentz River; November 1909; New Guinea Expedition, 1909; cotype of *Palaemon lorentzi* Roux. — 1 specimen 57 mm.
Verlaten Bocht, Lorentz River, S. W. New Guinea; May 31, 1907; New Guinea Expedition ,1906-1907. — 2 specimens 65 and 70 mm.
Pandanus Creek, Lorentz River, S. W. New Guinea; May 15 and September 17, 1907; New Guinea Expedition, 1906-1907. — 12 specimens 56-98 mm.
Bivak Island, Lorentz River, S. W. New Guinea; September 10, 1912; New Guinea Expedition, 1912. — 5 specimens 36-74 mm.
Regen, Island, Lorentz River, S.W.New Guinea; October 10, 1909; New Guinea Expedition, 1909. — 1 ovigerous female 86 mm.

The present species has been extensively described by Cowles (1914). The following details may be added:

The scaphocerite (fig. 34a) is somewhat less than thrice as long as broad. The external margin is convex or almost straight. The lamella distinctly overreaches the final tooth.

The oral parts are typical in shape.

The first pereiopod (fig. 34b) reaches with $^1/_3$ to $^1/_2$ of the length of the carpus beyond the scaphocerite. The fingers are as long as the palm (in the specimen from the Talaud Islands only one of the first legs is present, this leg has the fingers $^2/_3$ as long as the palm). The carpus is somewhat

more than twice as long as the chela, the merus is about 3/4 of the length of the carpus, the ischium is about half as long as the merus. The second pereiopod is extensively described by Cowles and J. Roux. The third pereiopod (fig. 34c) reaches with a small part of the propodus beyond the scaphocerite. The propodus is about 3.5 times as long as the dactylus, its posterior margin bears a row of about 10 spinules. The carpus is somewhat longer than half the propodus. The merus is of about the same length as the propodus. The ischium is slightly shorter than the carpus. The fifth pereiopod reaches less far forward than the third. The propodus in the fifth leg is four times as long as the dactylus, it is provided at the posterior margin with scattered spinules and distally with transverse rows of hairs. The carpus is more than half as long as the propodus. The merus is distinctly shorter than the propodus. The ischium is about half as long as the merus. In adult males the merus, carpus and propodus of the last three legs are covered with minute spinules, which are packed closest together at the carpus.

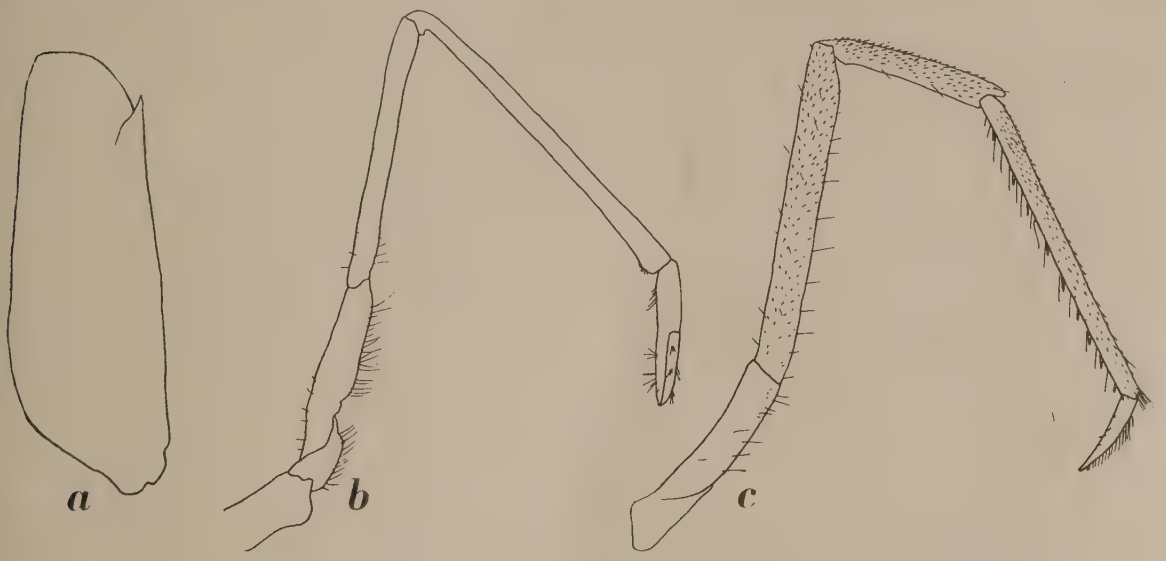

Fig. 34. *Macrobrachium mammillodactylus* (Thallwitz). a, scaphocerite; b, first pereiopod; c, third pereiopod. a-c, × 4.

The pleopods are normal in shape.

The present species was first described by Thallwitz (1892), who considered it a variety of *Macrobrachium idae*. Thallwitz's clear description, in which the most important characters of the species are mentioned, distinctly shows the identity of his species with *"Palaemon philippinensis"* Cowles, which was extensively described and figured by Cowles from the Philippines. Thallwitz's name is older than that of Cowles, so that the present species must be named *Macrobrachium mammillodactylus* (Thallwitz).

Nobili (1900a) described a new species of *"Palaemon"* from Surabaja, E. Java, which he named *P. Wolterstorffi*. His description is rather short and certainly insufficient to identify the species, but in 1908 De Man gave additional details of Nobili's type specimen, which make it possible to identify *P. wolterstorffi* with the present species. In all respects namely there is the closest resemblance between the present specimens and the two descriptions given of *P. wolterstorffi*; the characters concerning the shape of the rostrum and that of the second pereiopods being the most important. It is strange, however, that Nobili's specimen should originate from Java,

as up till now *M. mammillodactylus* has not yet been recorded from the western and southern part of the Malay Archipelago, and certainly not from Java, the carcinological fauna of which island is rather well known. Is it possible, however, that Nobili's specimen was wrongly labelled.

Palaemon talaverae Blanco (1939) is based on immature specimens (17-35 mm long) of a species of *Macrobrachium*; it in all probability belongs to the present species.

The specimens reported upon by Kubo (1940) under the name *Palaemon philippinensis* from the Riu-kiu Islands certainly do not belong to the present species, since Dr. Kubo states the tubercles along the cutting edges to be absent. It is possible that his material consists of females and "mâles féminisés" of *Macrobrachium formosense* Bate, the more so as in one of the localities from where Kubo obtained his *"philippinensis"* material also a large male of *M. formosense* (= *Palaemon longipes*) was found.

The specimen from Ga, Waigeo and many specimens from S.W. New Guinea were identified by Dr. J. Roux (1921, 1923) as *Palaemon sundaicus*. Examination of these specimens, all being females or young males, showed, however, that they in reality are *M. mammillodactylus* (vid. also under *M. equidens*, p. 170).

A damaged specimen of the present species from Alkmaar (S.W. New Guinea), was identified by J. Roux (1921) with *Palaemon lorentzi* J. Roux (cf. p. 214).

Distribution: The species is only known from fresh water, it is recorded in literature from: Luzon (Thallwitz, 1892), San Juan River, near Manila (Cowles, 1915; Estampador, 1937), ? Sampaloc Lake, San Pablo, Laguna Province, Luzon (Blanco, 1939), Surabaja, E. Java ? (Nobili, 1900a; De Man, 1908a), North Celebes (Thallwitz, 1892), Wai-Meniel River, Waigeo (J. Roux, 1923), Lorentz River, S.W. New Guinea (J. Roux, 1921), Alkmaar, Upper Lorentz River, Bivak Island in, and creek near Lorentz River, S.W. New Guinea (J. Roux, 1921).

Macrobrachium rude (Heller)

Palaemon rudis Heller, 1862a, Verh. zool.-bot. Ges. Wien, vol. 12, p. 527.
Palaemon rudis Heller, 1865, Reise Novara Zool., vol. 2 pt. 3, p. 114.
Palaemon (s.s.) *Mossambicus* Hilgendorf, 1879, Mber. Akad. Wiss. Berlin, 1878, p. 839, pl. 4 fig. 17.
? *Palaemon mossambicus* p.p. Pfeffer, 1889, Jb. Hamb. wiss. Anst., vol. 6 pt. 2, p. 34.
Palaemon rudis Ortmann, 1891, Zool. Jb. Syst., vol. 5, p. 716.
Palaemon mossambicus Ortmann, 1891, Zool. Jb. Syst., vol. 5, p. 741.
Palaemon rudis Koelbel, 1892, in De Man, Weber's Zool. Ergebn., vol. 2, p. 440 footnote.
Palaemon mossambicus Hilgendorf, 1898, Deutsch O. Afrika, vol. 4 pt. 7, p. 29.
Palaemon (*Eupalaemon*) *rudis* Coutière, 1900, C. R. Acad. Sci. Paris, vol. 130, p. 1266.
Palaemon (*Eupalaemon*) *rudis* Coutière, 1901, Ann. Sci. nat. Zool., ser. 8 vol. 12, p. 288, pl. 12 figs. 23, 24.
Palaemon (Eupalaemon) Alcocki Nobili, 1903, Boll. Mus. Zool. Anat. comp. Torino, vol. 18 n. 452, p. 9, fig. 5.
Palaemon (*Eupalaemon*) *rudis* Nobili, 1903, Boll. Mus. Zool. Anat. comp. Torino, vol. 18 n. 452, p. 11.
Eupalaemon rudis Stebbing, 1908, Ann. S. Afr. Mus., vol. 6, p. 41.
Palaemon rudis Henderson & Matthai, 1910, Rec. Indian Mus., vol. 5, p. 291, pl. 17 fig. 5.
Eupalaemon rudis Stebbing, 1910, Ann. S. Afr. Mus., vol. 6, p. 385.
Palaemon rudis Kemp, 1915, Mem. Indian Mus., vol. 5, p. 268.
Palaemon mossambicus Colosi, 1918, Monit. zool. Ital., vol. 29, p. 105.

Palaemon rudis Balss, 1930, Ergebn. Biol., vol. 6, p. 318.
Palaemon (*Eupalaemon*) *rudis* J. Roux, 1934, Faune Colon. Franç., vol. 5, p. 531.
Palaemon rudis Sewell, 1934, Rec. Indian Mus., vol. 36, p. 55.
Palaemon rudis Menon, 1938, Proc. Indian Acad. Sci., vol. 8B, p. 288, figs. 1-20.
Palaemon rudis Chopra, 1939, Journ. Bombay nat. Hist. Soc. vol. 41, p. 223, pl. 2 fig. 2.
Palaemon rudis Chopra, 1943, Indian Sci. Congr., vol. 30 pt. 2 sect. 6, p. 4.
Palaemon (*Eupalaemon*) *rudis* Vatova, 1943, Thalassia, vol. 6 pt. 2, p. 13, pl. 1 fig. 3.

Distribution: This species, which is not represented in the collections studied, is recorded from: Juba, Somaliland (Colosi, 1918; Vatova, 1943), Tanga on Sigli River, Tanganyika (Hilgendorf, 1898), Zanzibar ? (Hilgendorf, 1898), Mbusini, Uzeguha, Rukagura River, Tanganyika ? (Pfeffer, 1889), Kingani, Bagamoyo District, Tanganyika (Hilgendorf, 1898), Mozambique (Hilgendorf, 1879), Quelimane, Portuguese E. Africa (Hilgendorf, 1879), Durban (Stebbing, 1908, 1910), Madagascar (Coutière, 1900, 1901; J. Roux, 1934), Bemazaka, Ambongo, W. Madagascar (J. Roux, 1934), Ernakulam, Cochin State, S. India (Menon, 1938), Ceylon (Heller, 1862a, 1865), Pondicherry (Nobili, 1903), Madras (Henderson & Matthai, 1910), Cocanada (Henderson & Matthai, 1910), several localities in Chilka Lake (Kemp, 1915), vicinity of Calcutta (Kemp, 1915; Sewell, 1936), Ganges (Nobili, 1903).

Macrobrachium sintangense (De Man)

Palaemon (*Eupalaemon*) *elegans* De Man, 1892, Weber's Zool. Ergebn., vol. 2, p. 440, pl. 26 fig. 36. (non *Palaemon elegans* Rathke, 1837).
Palaemon elegans Ortmann, 1894, Denkschr. med.-naturw. Ges. Jena, vol. 8, p. 18.
Palaemon (*Eupalaemon*) *sintangensis* De Man, 1898a, Notes Leyden Mus., vol. 20, p. 138, pl. 6.
Palaemon nipponensis Lanchester, 1901, Proc. zool. Soc. Lond., 1901 pt. 2, p. 566. (non De Haan, 1849).
Palaemon (*Eupalaemon*) *elegans* De Man, 1902, Abh. Senckenb. naturf. Ges., vol. 25 p. 764.
Bithynis (*Eupalaemon*) *elegans* Rathbun, 1910, Bull. Mus. comp. Zoöl. Harvard, vol. 52, p. 316.
Palaemon elegans Koningsberger, 1913, Java zoöl. biol., p. 401.
Palaemon elegans Kemp, 1918a, Mem. Asiat. Soc. Bengal, vol. 6, p. 264.
Palaemon (*Eupalaemon*)*elegans* J. Roux, 1932, Arch. Hydrobiol., suppl. vol. 11, p. 569.
Palaemon (*Eupalaemon*) *sundaicus bataviensis* J. Roux, 1933, Rés. sci. Voy. Pr. Belg. Ind. or., vol. 3 pt. 14, p. 5.
Palaemon (*Eupalaemon*) *elegans* J. Roux, 1933, Rés. sci. Voy. Pr. Belg. Ind. or., vol. 3 pt. 14, p. 5.
Macrobrachium elegans Suvatti, 1937, Check-List aq. Fauna Siam, p. 49.

Museum Leiden

Belawan Deli, Eastcoast of Sumatra; June, 1927; leg. P. Buitendijk. — 2 specimens 46 & 54 mm.
Weltevreden, near Batavia, W. Java; in a small rivulet; November 15, 1917; leg. P. Buitendijk. — 4 specimens (1 ovigerous female) 41-62 mm.
River near Depok, between Batavia and Buitenzorg; September, 1929; leg. P. Buitendijk. — 5 specimens 28-52 mm.
Buitenzorg, W. Java; 1888-1889; leg. M. Weber; cotypes of *Palaemon elegans* De Man. — 4 specimens (1 ovigerous female) 46-58 mm.
Buitenzorg; 1893-1894; leg. W. Kükenthal. — 1 specimen 53 mm.
Buitenzorg; May, 1909; leg. H. H. van der Weele. — 5 specimens 30-52 mm.
Buitenzorg; April, 1922, February, 1927, September, 1927, July, 1930, October, 1930; leg. P. Buitendijk. — 20 specimens (3 ovigerous females) 25-53 mm.
Buitenzorg; in ponds of the Botanical Gardens; July, 1925; leg. P. Buitendijk. — 7 specimens (3 ovigerous females) 28-52 mm.

West Java; in river; February, 1929; leg. P. Buitendijk. — 1 specimen 40 mm.
Malang, E. Java; fresh water; leg. P. Buitendijk. — 4 specimens (1 ovigerous female) 42-61 mm.
Pasuruan, northcoast of E. Java; August, 1926; leg. P. Buitendijk. — 4 specimens 50-60 mm.
Besuki, northcoast of E. Java; 1865; leg. J. Semmelink. — 1 specimen 47 mm.
Java; leg. P. Bleeker. — 3 specimens (2 ovigerous females) 39-63 mm.
Sintang, Central Borneo, basin of Kapuas river; Borneo Expedition, 1894; cotypes of *Palaemon sintangensis* De Man. — 11 specimens (3 ovigerous females) 26-57 mm.

Museum Amsterdam

Deli, N. E. Sumatra; 1913, Januari, 1915; leg. L. P. de Bussy. — 59 specimens (including ovigerous females) 19-64 mm.
Sungai Putih, near Serdang, near Medan, N.E. Sumatra; September 10, 1909; leg. van Dedem. — 19 specimens (including ovigerous females) 34-52 mm.
Gunungsahilan, Central Sumatra; leg. J. P. Kleiweg de Zwaan. — 2 specimens 23 and 24 mm.
Tanahabang, Weltevreden near Batavia; fresh water; March 2, 1908; leg. P. N. van Kampen. — 37 specimens (12 ovigerous females) 23-56 mm.
Rawa Tjerut, Bekasi near Batavia; July, 1908; leg. E. Jacobson. — 7 specimens (1 ovigerous female) 22-39 mm.
Buitenzorg; 1888-1889; leg. M. Weber; cotypes of *Palaemon elegans* De Man. — 10 specimens (3 ovigerous females) 44-55 mm.
Buitenzorg; July, 1904; leg. K. Kraepelin. — 4 specimens (1 ovigerous female) 13-44 mm. (dry).
Buitenzorg. — 43 specimens (2 ovigerous females) 29-52 mm.
Sinagar, near Sukabumi, W. Java; 1888-1889; leg. M. Weber; cotypes *Palaemon elegans* De Man. — 6 specimens 21-58 mm.
Bandung, W. Java; leg. Huysmans. — 7 specimens (3 ovigerous females) 41-66 mm.
Panarukan, northcoast of West Java; 1928; leg. J. Verwey. — 1 ovigerous female 49 mm.
Market at Tulungagung, E. Java; leg. A. Doyer. — 4 specimens (1 ovigerous female) 34-48 mm.
Sintang, Central Borneo, basin of the Kapuas River; Borneo Expedition, 1894; cotypes of *Palaemon sintangensis* De Man. — 3 specimens 31-38 mm.

Museum Brussels

Buitenzorg, W. Java; 1929; voyage to the Dutch East Indies of the Prince and Princess Léopold of Belgium; Reg. No. 33 Crust. Mod. II I. G. 9223. — 4 specimens (2 ovigerous females) 38-53 mm.

The present species has been extensively described by De Man under the names *Palaemon* (*Eupalaemon*) *elegans* and *Palaemon* (*Eupalaemon*) *sintangensis*. I may add the following details:

The rostrum generally is straight, the tip sometimes is inconspicuously curved upwards. The rostral formula is $\frac{2\text{-}3)\ 9\text{-}13}{2\text{-}5}$. The teeth are divided regularly over the upper margin of the rostrum. In young specimens the rostrum is more slender than in the adults. In old specimens the carapace is scabrous by the presence of numerous tubercles, in the young it is smooth. The hepatic spine is almost as strong as the antennal and it is placed behind and slightly below the latter.

The pleura of the fifth segment has a blunt apex. The sixth segment is about 1.5 times as long as the fifth. The telson is somewhat less than twice as long as the sixth abdominal segment, it is of the common shape.

The eyes and the antennulae are normal in shape.

The scaphocerite has the outer margin straight or slightly convex. The final tooth is directed forwards and is much overreached by the rather narrow lamella. The scaphocerite is about 2.5 times as long as broad.

The oral parts are quite typical.

The first pereiopod has the carpus twice as long as the chela and the merus 4/5 of the length of the carpus. The fingers are slightly longer than the palm.

The legs of the second pair are equal in shape in males as well as in females or young specimens. De Man has extensively described the shape of the second pereiopods.

In the third leg the propodus is 2.5 times as long as the dactylus. The carpus is somewhat more than half as long as the propodus. The merus is as long as the propodus and is twice as long as the ischium. In the fifth leg the propodus is thrice as long as the dactylus and is almost twice as long as the carpus. All joints are provided with stiff short hairs.

The uropods and the pleopods are normal in shape.

The specimens from Borneo described by De Man (1898a) as new under the name *Palaemon (Eupalaemon) sintangensis* prove to belong to the same species as the specimens from Buitenzorg described by him (1892) some years earlier under the name *Palaemon (Eupalaemon) elegans*. Of both species the type material is at my disposal. Comparison of these typical specimens showed the identity of the two forms. In the large male of the type lot of *P. sintangensis* the chela of the second leg is not yet provided with the characteristic tubercles along the cutting edge, but this is only due to the fact that the specimen has not yet attained its full size as is shown by comparison with Javanese specimens. It is very strange that De Man did not compare his *Palaemon sintangensis*, which in most respects like in the shape of the rostrum, the second legs, the larger eggs, etc., shows so much resemblance to *P. elegans*, with the latter species.

The name *Palaemon elegans* of De Man (1892) is stillborn as this name has been used already as early as 1837 by Rathke for a species, already mentioned in the present paper (vid. *Palaemon elegans*, p. 55). De Man's name therefore is not valid and may not be used. The first valid name given to the present species is *Palaemon (Eupalaemon) sintangensis* De Man (1898a), so that the correct name for it becomes *Macrobrachium sintangense* (De Man, 1898a).

I have little doubt that the specimens from Tale Sap named by Lanchester (1901) *Palaemon nipponensis* in reality belong to the present species as has already been supposed by Kemp (1918a). Lanchester's description of the rostrum and of the large second leg of the male make the identity almost certain. The specimens certainly are no *Macrobrachium nipponense*.

The specimens from Buitenzorg collected by Weber (present in both the Amsterdam and Leiden Museum) are the types of *Palaemon elegans* De Man, those from Sintang (also present in both Musea) are the types of *Palaemon sintangensis* De Man. The specimens from Buitenzorg collected by Kükenthal (Museum Leiden) have been reported upon by De Man (1902).

The specimens of the Brussels Museum were kindly placed at my disposal by Professor Dr. V. van Straelen, the director of that Museum. These specimens were identified by J. Roux (1933) as *Palaemon sundaicus bataviensis* De Man (the name *bataviensis* is used by Roux on p. 5 of his paper, on p. 3, in the list of the species, he uses the name *batavianus* which is the name given originally by De Man). Roux thought his material to consist of juvenile specimens of De Man's form, this, however, is not correct as two of the specimens prove to be ovigerous females (Roux probably overlooked this, because the specimens have lost the larger part of their eggs, though still carrying enough to show their condition). The fact that the rostrum only bears two teeth at the ventral margin, and the large size of the eggs at once shows that the specimens certainly are no *Palaemon sundaicus* (= *Macrobrachium equidens*). Only one of the ovigerous females possesses

one of the second legs; the hairs of the chela are worn off, but the implantations of the hairs distinctly show that they were placed as in *M. sintangense*, namely in the basal part of the fingers only and not as in *M. equidens* over the entire surface of the finger. All these facts distinctly show that the specimens are no *Macrobrachium equidens* but belong to *M. sintangense*, which also is confirmed by that the latter species is very common near Buitenzorg, while the former never has been recorded from there, occurring mainly in brackish waters.

Distribution: The present species is found only in fresh waters, generally at a large distance from the sea, and often at high altitudes. It is recorded in literature from: Lampam, Patalung, Siamese Malay States (Kemp, 1918a), Tale Sap, Patalung, Siamese Malay States (Lanchester, 1901), Ban Kiriwong, Nakorn Sritamarat, Siamese Malay States (Suvatti, 1937), Dha Luang, Gwe Pasak River, Siamese Malay States (Suvatti, 1937), Sintang, Kapuas River, Borneo (De Man, 1898a), Buitenzorg, West Java (De Man, 1892, 1902; Ortmann, 1894; Rathbun, 1910; Kemp, 1918a; J. Roux, 1932, 1933), Sinagar near Sukabumi, West Java (De Man, 1892), Pandjalu Lake, West Java (J. Roux, 1933), various lakes near Klakah, E. Java (J. Roux, 1932). The species now is recorded for the first time from Sumatra.

Macrobrachium lanceifrons (Dana)

var. *lanceifrons* (Dana)

Palaemon lanceifrons Dana, 1852, Proc. Acad. nat. Sci. Philad., vol. 6, p. 26.
Palaemon lanceifrons Dana, 1852a, U.S. Explor. Exped., vol. 13, p. 589.
Palaemon lanceifrons Weitenweber, 1854, Lotos Praha, vol. 4, p. 61.
Palaemon lanceifrons Dana, 1855, U.S. Explor. Exped., vol. 13 atlas, p. 12, pl. 38 fig. 13.
? *Palaemon lanceifrons* p.p. Heller, 1865, Reise Novara Zool., vol. 2 pt. 3, p. 119.
non *Palaemon lanceifrons* Ortmann, 1891, Zool. Jb. Syst., vol. 5, p. 716.
Palaemon lanceifrons Koelbel, 1892, in De Man, Weber's Zool. Ergebn., vol. 2, p. 437 footnote.
Palaemon lanceifrons Cowles, 1914, Philipp. Journ. Sci., vol. 9 sect. D, p. 364, pl. 2 figs. 4, 5.
Palaemon lanceifrons Estampador, 1937, Philipp. Journ. Sci., vol. 62, p. 488.

var. *montalbanense* (Cowles)

Palaemon lanceifrons montalbanensis Cowles, 1914, Philipp. Journ. Sci., vol. 9 sect. D, p. 371, pl. 2 fig. 6.
Palaemon lanceifrons montalbanensis Estampador, 1937, Philipp. Journ. Sci., vol. 62, p. 488.

The present species, of which no material is at my disposal, is only known from the Philippines. The specimen recorded by Heller (1865) as *Palaemon lanceifrons* from Ceylon, according to Koelbel (1892), who examined Heller's types, probably is a young female of *"Palaemon equidens"*. Now it is not certain which species is meant by Koelbel with *Palaemon equidens*, but in all probability this is *Macrobrachium lar*, because Heller (1861) identified specimens of the latter species from Mauritius as *Palaemon equidens* and these specimens are examined by Koelbel (cf. Koelbel, 1892, p. 456 footnote). Heller's specimens from Manila identified as *Palaemon lanceifrons* indeed may belong to that species, but to little data are available to make this certain.

The specimen from Ceylon identified by Ortmann (1891) with *Palaemon lanceifrons* certainly does not belong there; I am not able, however, to find the real identity of the species as several important characters are not mentioned by Ortmann in his description.

Cowles (1914) gives an extensive description and figures of this species and its variety *montalbanense*.

Distribution: The species is only known with certainty from the neighbourhood of Manila, Luzon, from fresh water. The records in literature are: Manila, Luzon, Philippines (Dana, 1852; Heller, 1865; Estampador, 1937), San Juan River near Manila (Cowles, 1914). The variety *montalbanense* is collected at Montalban, near Manila (Cowles, 1914).

Macrobrachium novae-hollandiae (De Man)

Palaemon ornatus Haswell, 1882, Catal. Austr. Crust., p. 196 (non Olivier, 1811).
? *Palaemon* (*Eupalaemon*) *danae* De Man, 1908a, Ann. Mag. nat. Hist., ser. 8 vol. 1, p. 363, pl. 16. (non *Palaemon danae* Heller).
Palaemon (*Eupalaemon*) *novae-hollandiae* De Man, 1908a, Ann. Mag. nat. Hist., ser. 8 vol. 1, p. 370, pl. 16.
Palaemon novae-hollandiae McNeill, 1926a, Aust. Encycl., vol. 2, p. 325.
Palaemon (*Paralaemon*) *aemulus* Boone, 1935, Bull. Vanderbilt mar. Mus., vol. 6, p. 157, pl. 40. (non *Palaemon aemulus* Nobili).
? *Palaemon danae* Rick, 1942, Queensland Nat., vol. 12, p. 12.

Museum Amsterdam

Sydney; leg. A. R. McCulloch; coll. J. G. de Man (received January 25, 1908); type of *Palaemon novae-hollandiae* De Man. — 1 specimen 118 mm.

The present specimen, the type of the species, has been extensively described and figured by De Man (1908a). I only will add the following additional details:

The scaphocerite is rather slender, it is almost thrice as long as broad, the outer margin is straight. The final tooth is distinctly overreached by the lamella.

The oral parts are typical, as far as I could ascertain without damaging the specimen.

The pleopods are normal in shape.

As pointed out by De Man (1908a), the specimens mentioned by Haswell under the name *Palaemon ornatus,* do not belong to that species (= *Macrobrachium lar*), but are in reality *M. novae-hollandiae.*

In De Man's opinion the present species possibly is identical with *Palaemon danae* Heller. This, however, can not be correct: Koelbel (in De Man, 1892, p. 438), namely, in his notes on the type specimens of *Palaemon danae,* states that there are five teeth in the proximal part of the cutting edge of the dactylus of the second pereiopod of the juvenile type specimen. In *M. novae-hollandiae* there are constantly only two teeth present there. As I have already pointed out before (p. 133) *Palaemon danae* must be considered to be based on juvenile specimens of *Macrobrachium australe* (= *Palaemon dispar*). As the present species, as far as I can find, has not been described as new before 1908, the name *novae-hollandiae* proposed by De Man, in case that the species might prove to be distinct from *Palaemon danae,* must be used.

The specimen of which Boone (1935) gives a good description and figure under the name *Palaemon aemulus,* impossibly can belong to that species, as is distinctly shown by the shape of the rostrum and the second leg. Boone's specimen, which concluding from the enormous development of the second legs must be an adult male, and not a female as stated by her, differs from *M. aemulum* by possessing only two upper teeth of the rostrum behind the posterior limit of the orbit, while in *M. aemulum* there are 4 or 5 teeth there, furthermore the rostrum in Boone's specimen is much longer and higher than that of *M. aemulum,* while the lower margin bears 5 teeth (in *M. aemulum*

only 2 or 3 teeth are present). Also the second leg differs strongly from that of *M. aemulum*, by having the fingers distinctly shorter than half the palm and by having the carpus and chela much more elongate. Boone's specimen in all respects agrees with *Macrobrachium novae-hollandiae*, so that I do not hesitate to identify the specimen with that species. In her description Boone states the specimen to have 8 dorsal teeth on the rostrum, in her figure, however, 10 teeth are visible, which is the number present also in De Man's type specimen of the present species.

Distribution: The species is recorded in literature from: Australia (Haswell, 1882), Sydney, New S. Wales (De Man, 1908a), Queensland (De Man, 1908a), New Caledonia (Boone, 1935). Rick (1942) reports *Palaemon danae* from Queensland: as I could not consult his paper I do not know anything about the identity of his specimens.

Macrobrachium venustum (Parisi)

Palaemon (*Eupalaemon*) *vernustus* Parisi, 1919, Atti Soc. Ital. Sci. nat., vol. 58, p. 82, pl. 4 fig. 1, pl. 6 figs. 5, 13 (*venustus* on pp. 92 and 93).
Macrobrachium venustus Gee, 1925, Lingnaam agric. Rev., vol. 3, p. 158.

This species is only known from the specimen recorded by Parisi from Hainan, S. China. I have seen no material of it.

The specific name *vernustus* used by Parisi on p. 82 of his article obviously is a typographical error, as the name *venustus* is used thrice in the explanation of the plates of his paper.

Macrobrachium formosense Bate

Palemon longipes De Haan, 1849, Fauna Japonica, Crust., p. 171 (non Olivier, 1811).
Macrobrachium formosense Bate, 1868a, Proc. zool. Soc. Lond., 1868, p. 364, pl. 31 fig. 1.
Macrobrachium formosense Semper, 1868, Proc. zool. Soc. Lond., 1868, p. 586.
Palaemon longipes De Man, 1879, Notes Leyden Mus., vol. 1, p. 177.
Palaemon formosensis Ortmann, 1891, Zool. Jb. Syst., vol. 5, p. 713.
Palaemon longipes Ortmann, 1891, Zool. Jb. Syst., vol. 5, p. 715.
Palaemon (*Eupalaemon*) *longipes* De Man, 1897, Zool. Jb. Syst., vol. 9, p. 770.
Palaemon (*Eupalaemon*) *longipes* De Man, 1898, Zool. Jb. Syst., vol. 10, p. 707, pl. 37 fig. 69.
Bithynis longipes Rathbun, 1902b, Proc. U.S. Nat. Mus., vol. 26, p. 53.
? *Palaemon* (*Eupalaemon*) *longipes* Borradaile, 1907, Trans. Linn. Soc. Lond., ser. 2 vol. 12, p. 67.
Palaemon (*Eupalaemon*) *longipes* De Man, 1908a, Ann. Mag. nat. Hist., ser. 8 vol. 1, p. 367.
Palaemon longipes Balss, 1914, Abh. Bayer. Akad. Wiss., suppl. vol. 2 pt. 10, p. 59.
Palaemon (*Eupalaemon*) *longipes* Parisi, 1919, Atti Soc. Ital. Sci. nat., vol. 58, p. 79, pl. 6 fig. 4.
Bithynis longipes Urita, 1921, Dobuts. Zasshi, vol. 33, pp. 214-220.
Macrobrachium longipes Maki & Tsuchiya, 1923, Rep. Dept. Agric. Formosa, vol. 3, p. 61, pl. 7 fig. 3.
Macrobrachium longipes Kubo, 1937, Bull. Japan. Soc. sci. Fish., vol. 5, p. 346.
? *Palaemon philippinensis* Kubo, 1940, Journ. Imp. Fish. Inst. Tokyo, vol. 34, p. 10, textfigs. 3, 4, pl. 1 fig. d.
Palaemon longipes Kubo, 1940, Journ. Imp. Fish. Inst. Tokyo, vol. 34, p. 11, textfig. 5, pl. 1 fig. d.

Museum Leiden

Japan; cotypes of *Palaemon longipes* De Haan. — 5 specimens 86-89 mm.

Museum Amsterdam

Takao, Formosa. — 6 specimens (1 ovigerous female) 67-106 mm.
Locality unknown. — 4 specimens 60-96 mm.

The present species has been extensively described and figured by De Man (1897). To this description I only will add the following remarks:

The hepatic spine is placed obliquely below the antennal and does not lie in one line with it.

The pleura of the fifth abdominal segment has the apex bluntly pointed.

The antennule is of the normal shape.

The scaphocerite is about 2.5 times as long as broad, the lamella has the apex rounded. The outer margin is straight or slightly convex.

The oral parts are quite normal. The third maxillipede reaches only to the end of the second segment of the antennular peduncle.

The first leg reaches with the chela beyond the scaphocerite. The second legs are much less developed in the female than in the male, in the female they reach with the larger part of the carpus beyond the scaphocerite. The right and left leg are equal in shape. All the joints of these legs are provided with spinules, but these are much smaller than those of the male. The fingers measure about $^2/_3$ of the length of the palm; in the proximal half of its cutting edge the dactylus bears two teeth, while the fixed finger is provided with one tooth on the cutting edge. No hairs are present on the chela. The carpus is as long as the palm. The merus measures $^5/_7$ of the length of the carpus. The ischium is almost as long as the merus. The last three pereiopods are equal in shape. The third leg reaches the end of the scaphocerite, the other legs do not reach so far. The propodus is 2.5 times as long as the dactylus. The carpus is somewhat more than half as long as the propodus, the merus is twice as long as the carpus, the posterior margin of the propodus bears the usual row of spines. No tubercles as in the male are present on the joints of the last three legs, though sometimes small spinules may be detected. The fifth leg is somewhat more slender than the third.

The pleopods of the male have the usual shape.

The eggs are numerous and small, they measure 0.4 to 0.5 mm.

Macrobrachium formosense Bate, undoubtedly belongs to the same species as *Palemon longipes* De Haan, which is already supposed by Balss (1914). Bate's description and figures in every detail agree with the present species, but for the absence of lower teeth on the rostrum, but this perhaps is only an abnormality or due to wrong observation. In Bate's figure only 8 dorsal teeth are shown on the rostrum, but this obviously is an error, because in the description 11 teeth are mentioned.

It is very improbable that the specimens brought by Borradaile (1907) with some doubt to *Palaemon longipes,* really belong here, as Borradaile's specimens were collected at the Seychelles and *M. formosense* never has been found outside Japanese waters. Borradaile gives too few characters, however, to make the real identity of his specimens certain.

Kubo (1940) mentioned under the name *Palaemon philippinensis* Cowles some specimens from the Riukiu Islands. The fact that the males do not possess tubercles along the cutting edges makes the identification very doubtful. Kubo thinks his specimens specifically distinct from *Macrobrachium formosense* because of the shorter chelipeds of the second pair, which have the fingers not gaping. The character of the long second legs, which have the fingers gaping, however, only may

be observed in fully developed males of *Macrobrachium formosense*, and the two specimens brought by Kubo to the latter species (under the name *Palaemon longipes*) indeed are large males. In my opinion it is very probable that Kubo's specimens, identified by him with *Palaemon philippinensis* Cowles, in reality are females, "mâles féminisés" and juveniles of *Macrobrachium formosense*, the more as the shape of the rostrum figured by Kubo for his specimens agrees perfectly with that of *M. formosense* and is different from that of *M. mammillodactylus* (= *Palaemon philippinensis*). The fact that one of Kubo's males of *Palaemon longipes* and part of his *Palaemon philippinensis* material originates from the same locality (Sirakawa, Miyako, Riukiu Islands) supports this supposition.

The name *Palaemon longipes* De Haan (1849) for the present species may not be used as it is invalidated by *Palaemon longipes* Olivier (1811); the latter name being a synonym of *Stenopus hispidus* (Olivier). The name *Macrobrachium formosense* Bate (1868) must be used for the present species as it is the first valid name given to it.

Distribution: This species occurs in freshwater, it is only known with certainty from the Japanese Islands and Formosa. The records in literature are: ? Côte d'Or, Praslin, Seychelles (Borradaile, 1907), Japan (De Haan, 1849; De Man, 1879, 1897, 1908), Kamakura, Sagamibay (Kubo, 1940), Fukuura and Ito, Sagamibay (Balss, 1914), Amami, Oshima, Sagamibay (Parisi, 1919), Asaki River near Okayama, S. Hondo (Balss, 1914), Kagoshima, Kyushyu (Urita, 1921), Kawatana [1]) (Rathbun, 1902b), Nagasaki, Kyushyu (Rathbun, 1902b; Parisi, 1919), Okinawa, Riukiu Islands (Parisi, 1919), Kuzi-gawa, Genka-gawa, Izumi, Okinawa (Kubo, 1940), Sirakawa, Miyako, Riukiu Islands (Kubo, 1940), Ogasawara, Bonin Islands (Balss, 1914), Formosa (Maki & Tsuchiya, 1923), Tamsui, N. Formosa (Bate, 1868a; Balss, 1914), S. Formosa (Balss, 1914).

Macrobrachium hainanense (Parisi) (fig. 35)

Palaemon (*Parapalaemon*) *hainanense* Parisi, 1919, Atti Soc. Ital. Sci. nat., vol. 58, p. 87, pl. 3 fig. 1, pl. 6 figs. 1, 7.
Macrobrachium hainanense Gee, 1925, Lingnaam agric. Rev., vol. 3, p. 158.
Palaemon similis Yu, 1931, Bull. Soc. zool. France, vol. 56, p. 281, fig. 2.
Palaemon Hainane Yu, 1931, Bull. Soc. zool. France, vol. 56, p. 285.

Museum Leiden

Pools near the Laboratorium voor het Onderzoek der Zee (Laboratory for Marine Investigations), Batavia; January 24, 1906; leg. P. N. van Kampen. — 3 specimens (1 ovigerous female) 58-91 mm.
Java; leg. P. Bleeker. — 8 specimens (2 ovigerous females) 47-67 mm.

Museum Amsterdam

Tanahabang, Weltevreden, near Batavia; fresh water; March 2, 1908; leg. P. N. van Kampen. — 13 specimens (4 ovigerous females) 27-66 mm.

The rostrum (fig. 35a) is straight, sometimes it has the tip curved inconspicuously upwards; it reaches slightly beyond the antennular peduncle, but distinctly fails to reach the end of the scaphocerite. The upper margin is convex and bears from 11 to 15 teeth (generally 12, in one specimen only

1) The exact position of this locality is unknown to me.

9 teeth are present), which are divided regularly over the rostrum, though the first tooth generally is distinctly more remote from the second than the third is. The first three teeth are placed on the carapace behind the posterior limit of the orbit, the fourth is placed just over or even slightly behind the posterior margin of the orbit. The lower margin of the rostrum too is convex, it is armed with three teeth. The carapace in the adult males is entirely roughened by numerous small spinules, which are most distinct in the anterolateral portion of the carapace. The hepatic spine is somewhat less strong than the antennal and is placed below and behind it.

The abdomen has the pleurae of the first three segments broadly rounded, in the fourth and fifth segments the pleurae are narrower, but the tips are rounded. In the adult males the pleurae are provided with numerous small spinules, which are strongest near the lateral margins, also the sixth segment bears some spinules in the lateral part. The sixth segment measures about $1^1/_3$ of the length of the fifth.

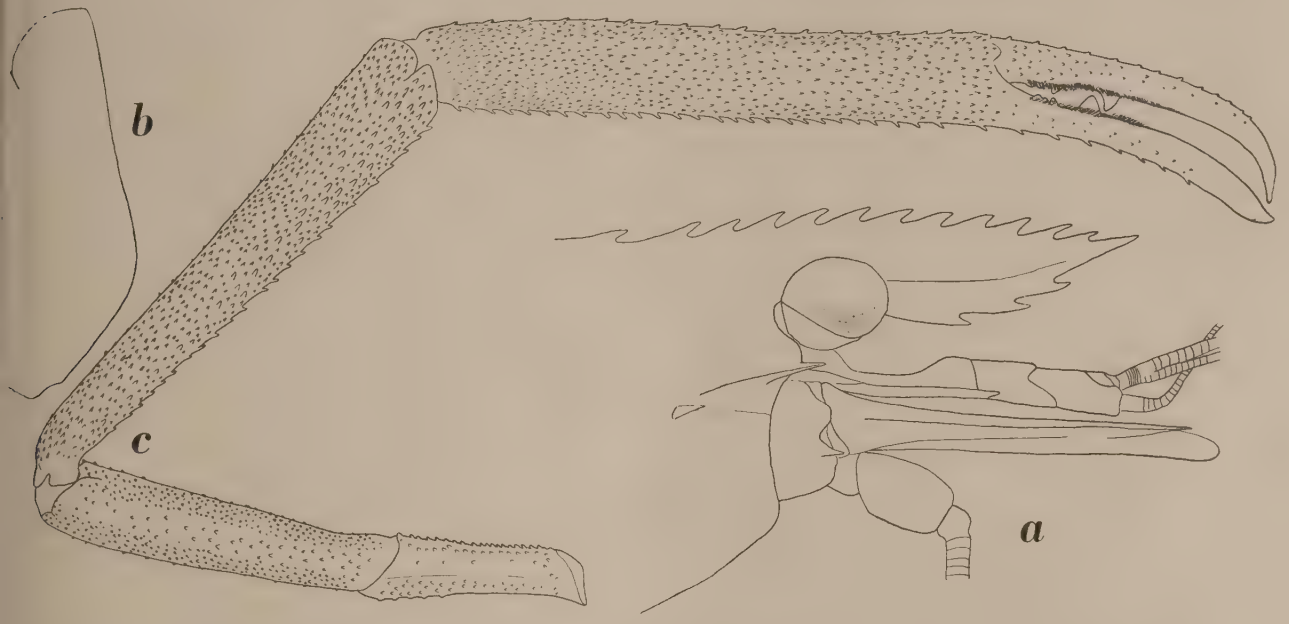

Fig. 35. *Macrobrachium hainanense* (Parisi). a, anterior part of body in lateral view; b. scaphocerite; c, second leg of adult male. a, b, × 3; c, × 2.

The telson is 1.5 times as long as the sixth segment of the abdomen. In the adult male it is covered with numerous small spinules, the two pairs of dorsal spines are placed as usual at about the middle and at about $^3/_4$ of the length of the telson. The tip of the telson is pointed and flanked by the usual two pairs of spines, the inner of which reaches distinctly beyond the tip of the telson; numerous setae are present between the inner spines.

The eyes are normal in shape, the cornea is distinctly broader than the eyestalk.

The antennula has the usual shape.

The scaphocerite (fig. 35b) has the outer margin straight or slightly convex, the final tooth is strong and is distinctly overreached by the lamella, which is somewhat angular at its anterointernal angle. The scaphocerite is almost 2.5 times as long as broad.

The oral parts are typical. The third maxillipede reaches slightly beyond the end of the second segment of the antennular peduncle.

The first pereiopod reaches with about 1/3 to 1/2 of the length of the carpus beyond the scaphocerite, in small specimens it reaches less far. The fingers are as long as the palm. The carpus is twice as long as the chela and is 1 1/3 as long as the merus. The second pereiopods of the adult male (fig. 35c) are very strong, they are distinctly longer than the entire body. They are about equal in shape. The fingers are slender, with the apex curved. The dactylus bears two, the fixed finger one strong tooth in the proximal part of the cutting edge; between the tooth of the fixed finger and the base of the cutting edge some 2 or 3 small denticles may be seen. Along both sides of the cutting edges of the dactylus and the fixed finger a row of velvety hairs is present; this row is most distinct in the proximal part; the rest of the fingers is naked, though small horny spines are present on the dactylus as well as on the fixed finger. The palm is cylindrical or slightly compressed, of equal height throughout its length; it is covered with numerous small horny spinules, which are most dense at the outer surface. At the inner surface there are also larger horny spinules, of the same type as the spinules on the fingers. The palm is about 5 times as long as wide and about 1.5 times as long as the fingers. The carpus is about as long as the palm, it narrows posteriorly and is covered with spinules in the same way as the palm. The merus measures about 2/3 of the length of the carpus. The ischium is 3/5 of the length of the merus. In the females and in the young males the leg is shorter than the body. It resembles that of the adult male in most respects, except for the relation between the various joints. In small specimens the fingers in relation to the palm are longer than in the large specimens, furthermore the carpus, in relation to the palm, is slightly shorter, also the ischium in the young specimens is longer in relation to the merus. The following measurements (in mm.) are taken from my material:

material	sex	total length of the body	length of the joints of the 2nd leg				
			fingers	palm	carpus	merus	ischium
Batavia	♂	86	24	37	38	24	14
	ov. ♀	86	12.2	21	21.8	14.5	8
			13.7	23	24	15.5	8
	♂	59	7.1	9.2	10	8.2	6.3
			10	14	14	10.5	8
Java	♂	67	16	26.5	27	16	10
Weltevreden	♂	66	10.5	16	17	12	8
			12.8	19	19	13.5	8
	ov. ♀	43	5	6	6.3	5.2	4
	?	?	6.2	8	8.5	7	5
	♂	41	5	6	7	5	4

The third pereiopod in the adult males reaches slightly beyond the scaphocerite, in females and younger males it reaches somewhat less far forwards. The dactylus is rather short, the propodus is slightly more than 2.5 times as long as the dactylus, it bears the usual posterior spines. The carpus is distinctly more than half as long as the propodus. The merus is longer than the entire propodus. The ischium is about half as long as the merus. The fifth leg reaches about to the end of the antennular peduncle. The propodus is 2.5 times to thrice as long as the dactylus, the carpus is more than half as long as the propodus, the merus is about as long as the propodus. The last three pairs of legs bear long scattered and stiff hairs, while moreover in those of the adult male all the joints are covered with numerous spinules, which are placed close together.

The pleopods and uropods are normal in shape. In the adult male the uropods are thickly covered with spinules.

The eggs are numerous and small, they are 0.4 to 0.6 mm in diameter. The smallest ovigerous female is 35 mm, the largest 86 mm long.

Palaemon similis of Y u (1931) can not be regarded to be specifically distinct from *Macrobrachium hainanense* as it agrees in all respects with that species. According to Y u the difference between *P. similis* and *P. Hainane* (sic!) is that in the former species the carpus of the second leg is as long as or longer than the palm, while in the latter it is slightly shorter than the palm; the relation between palm and carpus in *P. hainanense* is, according to P a r i s i, 1.03, in *P. similis* it varies between 1.00 and 0.95. In my opinion this difference is too small to be of specific value, the more as it is very variable in most species of the present genus. Furthermore Y u states the fingers of *P. hainanense* to be longer in relation to the palm than those of *P. similis;* the relation palm / fingers in *P. hainanense* is 1.6, in *P. similis* it varies between 1.7 and 2.0. This too is insufficient for the distinction of two species, as also the relation between the lengths of the palm and the fingers always is very variable. As last difference Y u mentions that in *P. hainanense* the telson hardly reaches the end of the uropods, while in *P. similis* it fails with 1/4 of its length to reach the end of the uropods. This character of course is of no value as the situation of the end of the telson and that of the uropods is entirely dependant on the curvature of the abdomen. As these three characters are too variable (as is also shown by my material) and their differences too small, and as in all others respects there is a close resemblance between *P. similis* and *P. hainanense,* I see no reason and no possibility to treat the two forms as distinct species.

Macrobrachium hainanense is so very closely related to *Macrobrachium formosense,* that it perhaps only must be considered a subspecies of that species. The differences between the two forms are:

1. In *M. formosense* the rostrum bears 10 or 11 dorsal teeth (seldom 12), while in *M. hainanense* the number of dorsal teeth varies between 12 and 14 (seldom being 11).

2. In *M. formosense* the second pereiopod of the adult male is much more slender than in *M. hainanense.* In the former species the carpus in the adult male is at least 9 times as long as broad, while in the latter it is less than 7 times as long as broad. The same relation also is found between the length and the breadth of the palm in both species. In *M. formosense* furthermore the fingers of the adult male often are less than half as long as the palm, while in *M. hainanense* they are at least half as long as the palm, being generally longer.

Whether these differences really are constant, only may be proved by larger material than that which I have at my disposal. It is very well possible that larger males of *M. hainanense* have the second legs more elongate.

The native name of this species near Batavia is "udang pelutuk"; the word "udang" means "prawn", the meaning of the word "pelutuk" is unknown to me.

Distribution: The species up till now only has been recorded from S. China: Amoy (Y u, 1931), Keng-kong River, Hainan (P a r i s i, 1919). The present records from Java largely extend our knowledge of the range of distribution of the species. Little is known about the environment in which the species lives, the indication Keng-kong River points to fresh water, which is confirmed by the specimens from Weltevreden (Museum Amsterdam), the pools near the Laboratory for Marine Investigations at Batavia were formed by floodings of the river, the prawns collected in it may therefore originate from localities more inland.

Macrobrachium equidens (Dana) (fig. 36)

Palaemon equidens Dana, 1852, Proc. Acad. nat. Sci. Philad., vol. 6, p. 26.
Palaemon equidens Dana, 1852a, U.S. Explor. Exped., vol. 13, p. 591.
Palaemon equidens Weitenweber, 1854, Lotos Praha, vol. 4, p. 62.
Palaemon equidens Dana, 1855, U.S. Explor. Exped., vol. 13 atlas, p. 12, pl. 39 fig. 2.
non *Palaemon equidens* Heller, 1862, S.B. Akad. Wiss. Wien, vol. 45 pt. 1, p. 418, pl. 2 fig. 44.
Palaemon equidens (*aequidens*) Von Martens, 1868, Arch. Naturgesch., vol. 34 pt. 1, p. 40.
Palaemon equidens De Man, 1888a, Journ. Linn. Soc. Lond. Zool., vol. 22, p. 283.
Palaemon equidens Ortmann, 1891, Zool. Jb. Syst., vol. 5, p. 718.
Palaemon (*Eupalaemon*) *sundaicus?* De Man, 1892, Weber's Zool. Ergebn., vol. 2, p. 437, pl. 26 fig. 35.
non *Palaemon* (*Eupalaemon*) *equidens* De Man, 1892, Weber's Zool. Ergebn., vol. 2, p. 453, pl. 26 fig. 36.
Palaemon (*Eupalaemon*) *sundaicus* De Man, 1897, Zool. Jb. Syst., vol. 9, p. 779.
Palaemon (*Eupalaemon*) *sundaicus* var. De Man, 1897, Zool. Jb. Syst., vol. 9, p. 783.
Palaemon sundaicus bataviana De Man, 1897, Zool. Jb. Syst., vol. 9, p. 784.
Palaemon (*Eupalaemon*) *sundaicus* Weber, 1897, Zool. Jb. Syst., vol. 10, p. 165.
Palaemon (*Eupalaemon*) *sundaicus* De Man, 1898, Zool. Jb. Syst., vol. 10, p. 708, pl. 37 figs. 70 m, n, 71.
Palaemon (*Eupalaemon*) *sundaicus* var. De Man, 1898, Zool. Jb. Syst., vol. 10, pl. 37 figs. 70 o, p. 72.
Palaemon (*Eupalaemon*) *sundaicus* Hilgendorf, 1898, Deutsch O. Afrika, vol. 4 pt. 7, p. 30.
Palaemon (*Eupalaemon*) *sundaicus brachydactyla* Nobili, 1899, Ann. Mus. Stor. nat. Genova, vol. 40, p. 238.
Palaemon sundaicus De Mani Nobili, 1899, Ann. Mus. Stor. nat. Genova, vol. 40, p. 239.
Palaemon (*Eupalaemon*) *acanthosoma* Nobili, 1899, Ann. Mus. Stor. nat. Genova, vol. 40, p. 242.
Palaemon (*Eupalaemon*) *sundaicus* Coutière, 1900, C. R. Acad. Sci. Paris, vol. 130, p. 1266.
Palaemon Sundaïcus Coutière, 1901, Ann. Sci. nat. Zool., ser. 8 vol. 12, p. 332, pl. 14 figs. 44-46.
non *Palaemon equidens* Lanchester, 1901, Proc. zool. Soc. Lond., 1901 pt. 2, p. 565, pl. 34 fig. 4.
Palaemon sundaicus Lanchester, 1901, Proc. zool. Soc. Lond., 1901 pt. 2, p. 568.
Palaemon (*Eupalaemon*) *sundaicus baramensis* De Man, 1902, Abh. Senckenb. naturf. Ges., vol. 25, p. 769.
Palaemon (*Eupalaemon*) *sundaicus* Nobili, 1903, Boll. Mus. Zool. Anat. comp. Torino, vol. 18 n. 452, p. 8.
Palaemon (*Eupalaemon*) *nasutus* Nobili, 1903a, Boll. Mus. Zool. Anat. comp. Torino, vol. 18 n. 455, p. 9, textfig.
Palaemon (*Eupalaemon*) *sundaicus* var. Nobili, 1903a, Boll. Mus. Zool. Anat. comp. Torino, vol. 18 n. 455, p. 11.
Palaemon sundaicus Lanchester, 1906, Fasc. Malay. Zool., vol. 3, p. 132.
Palaemon (*Eupalaemon*) *acanthosoma* De Man, 1908a, Ann. Mag. nat. Hist., ser. 8 vol. 1, p. 369.
Palaemon sulcatus Henderson & Matthai, 1910, Rec. Indian Mus., vol. 5, p. 289, pl. 16 fig. 4.
Bithynis (*Eupalaemon*) *sundaicus* Rathbun, 1910, Bull. Mus. comp. Zoöl. Harvard, vol. 52, p. 316.
Eupalaemon sundaicus Stebbing, 1910, Ann. S. Afr. Mus., vol. 6, p. 384.
Palaemon sundaicus Cowles, 1914, Philipp. Journ. Sci., sect. D vol. 9, p. 355, pl. 2 fig. 3.
Palaemon (*Eupalaemon*) sp. De Man, 1915, Zool. Jb. Syst., vol. 38, p. 425, pl. 29 fig. 8.
Palaemon (*Eupalaemon*) *acanthosoma* De Man, 1915, Zool. Jb. Syst., vol. 38, p. 427, pl. 29 figs. 10, 11.
Palaemon sundaicus Stebbing, 1915, Ann. S. Afr. Mus., vol. 15, p. 73.
Palaemon delagoae Stebbing, 1915, Ann. S. Afr. Mus., vol. 15, p. 74, pl. 16.
Palaemon (*Eupalaemon*) *sundaicus* J. Roux, 1917, Nova Guinea, vol. 5, p. 597.
Palaemon (*Eupalaemon*) *acanthosoma* J. Roux, 1917, Nova Guinea, vol. 5, p. 597.
Palaemon sundaicus Kemp, 1918a, Mem. Asiat. Soc. Bengal, vol. 6, p. 261.
Palaemon (*Eupalaemon*) *sundaicus* J. Roux, 1919, Abh. Senckenb. naturf. Ges., vol. 35, p. 334.

Palaemon (*Eupalaemon*) *acanthosoma*. J. Roux, 1919, Abh. Senckenb. naturf. Ges., vol. 35, p. 334.
Palaemon (*Eupalaemon*) *sundaicus* p.p. J. Roux, 1921, Nova Guinea, vol. 13, p. 590.
? *Macrobrachium sundaicus* Maki & Tsuchiya, 1923, Rep. Dept. Agric. Formosa, vol. 3, p. 57, pl. 2 fig. 2.
? *Macrobrachium equidens* Maki & Tsuchiya, 1923, Rep. Dept. Agric. Formosa, vol. 3, p. 62, pl. 6 fig. 1.
Palaemon (*Eupalaemon*) *sundaicus* p.p. J. Roux, 1923, Capita Zool., vol. 2 pt. 2, p.6.
Urocaridella borradailei Stebbing, 1923, Rep. Fish. mar. biol. Surv. S. Afr., vol. 3 pt. 3, p. 8, pl. 14.
Eupalaemon sundaicus Barnard, 1926, Trans. Roy. Soc. S. Afr., vol. 13, p. 121.
Palaemon sundaicus Yu, 1931, Bull. Soc. zool. France, vol. 56, p. 276.
Palaemon nasutus Nouvel, 1932, Bull. Mus. Hist. nat. Paris, ser. 2 vol. 4, p. 409.
Palaemon (*Eupalaemon*) *sundaicus* J. Roux, 1932, Arch. Hydrobiol., suppl. vol. 11, p. 569.
non *Palaemon* (*Eupalaemon*) *sundaicus bataviensis* J. Roux, 1933, Rés. sci. Voy. Pr. Belg. Ind. or., vol. 3 pt. 14, p. 5.
Palaemon (*Eupalaemon*) *acanthosoma* J. Roux, 1934a, Rev. Suisse Zool., vol. 41, p. 218.
Palaemon delagoae Rathbun, 1935, Bull. Mus. comp. Zoöl. Harvard, vol. 79, p. 28, figs. 1, 2.
Palaemon sundaicus Estampador, 1937, Philipp. Journ. Sci., vol. 62, p. 489.
Palaemon sulcatus Panikkar, 1937, Journ. Bombay nat. Hist. Soc., vol. 39, p. 346.
Macrobrachium sundaicus Suvatti, 1937, Check List aq. Fauna Siam, p. 49.
? *Palaemon sundaicus* Kubo, 1940, Journ. Imp. Fish. Soc. Tokyo, vol. 34, p. 20, fig. 11.
? *Palaemon sundaicus* Kubo, 1941, Trans. biogeogr. Soc. Japan, vol. 3, p. 313, fig. 7.
Palaemon sulcatus Nataraj, 1942, Curr. Sci., vol. 11, p. 468.
Palaemon sundaica Barnard, 1947, Ann. Mag. nat. Hist., ser. 11 vol. 13, p. 390.

Siboga Expedition

Station 4, Anchorage off Djangkar, Java, 7° 42′ S, 114° 12′.6 E; shore exploration; March 9, 1899. — 4 specimens (1 ovigerous female) 51-66 mm.
Station 131, Anchorage off Beo, Talaud Islands; reef exploration; depth 13 m; bottom mud and sand; July 24 and 25, 1899. — 1 specimen 75 mm.
Station 181 or 231, Amboina anchorage; reef exploration; September 5-11 or November 14-18, 1899. — 1 ovigerous female 72 mm.

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Santa Lucia Bay, Natal; October 26, 1938; leg. L. D. Brongersma. — 1 ovigerous female 68 mm.
Port Dickson, Malay Peninsula; in sea; March, 1946; leg. L. D. Brongersma. — 1 specimen 71 mm.
We Island, off northpoint of Sumatra; May, 1922, February, May and July, 1927; leg. P. Buitendijk. — 6 specimens (3 ovigerous females) 46-70 mm.
Sinabang, Simalur, off westcoast of Sumatra; January and February, 1913; leg. E. Jacobson. — 8 specimens 43-73 mm.
Sibigo, Simalur, off westcoast of Sumatra; August, 1913; leg. E. Jacobson. — 1 specimen 43 mm.
Harbour of Belawan Deli, eastcoast of Sumatra; brackish water; December, 1924; leg. P. Buitendijk. — 9 specimens (1 ovigerous female) 38-70 mm.
Belawan Deli; September, 1930; leg. P. Buitendijk. — 2 specimens 38 and 92 mm.
Tandjong Priok, near Batavia, W. Java; 1906, 1907, November, 1926, May and August, 1927; leg. P. Buitendijk. — 14 specimens (3 ovigerous females) 50-97 mm.
Mouth of river, West of Tandjong Priok; July, 1911; leg. P. Buitendijk. — 2 specimens (1 ovigerous female) 62 and 71 mm.
Fishmarket, Batavia; March, 1917; leg. P. Buitendijk. — 1 specimen 50 mm.
River near Batavia; 1896; leg. A. G. Vorderman. — 1 ovigerous female 67 mm.
River near Batavia; 1896; leg. A. G. Vorderman; cotypes of *Palaemon sundaicus* var. *bataviana* De Man. — 3 ovigerous females 72-91 mm.
Singkil Island, probably near Batavia; 1876; don. F. A. Jentink. — 3 specimens 58-88 mm.

Bay of Batavia; January, 1908, 1909, December, 1924 and November, 1926; leg. P. Buitendijk. — 8 specimens (3 ovigerous females) 60-88 mm.
Indramaju, northcoast of W. Java; September, 1924; leg. P. Buitendijk. — 14 specimens (7 ovigerous females) 45-64 mm.
Cheribon, northcoast of W. Java; August, 1929; leg. P. Buitendijk. — 6 ovigerous females 52-70 mm.
Tjilatjap, southcoast of Central Java; August, 1905; leg. P. Buitendijk. — 3 specimens 33-39 mm.
Tegal, northcoast of Central Java; November, 1927; leg. P. Buitendijk. — 3 specimens 64-79 mm.
Off Semarang, northcoast of Central Java; March, 1912; leg. P. Buitendijk. — 1 specimen 54 mm.
Surabaja, northcoast of E. Java; April, 1926, February, 1927, July and October, 1930; leg. P. Buitendijk. — 10 specimens (8 ovigerous females) 54-93 mm.
Pasuruan, northcoast of E. Java; September, 1921; leg. P. Buitendijk. — 1 ovigerous female 66 mm.
Probolinggo, northcoast of E. Java; August 1, 1926; leg. P. Buitendijk. — 1 specimen 77 mm.
Fishmarket of Panarukan, northcoast of E. Java; February, 1924; leg. P. Buitendijk. — 2 specimens (1 ovigerous female) 78 and 86 mm.
Panarukan; August, 1927; leg. P. Buitendijk. — 1 ovigerous female 84 mm.
Southcoast of Madura; January, 1917; leg. P. Buitendijk. — 4 specimens 61-66 mm.
Madura; July, 1928; leg. P. Buitendijk. — 1 ovigerous female 96 mm.
Java Sea; 1906, December, 1907, October, 1911; leg. P. Buitendijk. — 11 specimens (5 ovigerous females) 53-84 mm.
Borneo; 1846; leg. C. A. L. M. Schwaner. — 2 specimens 78 and 79 mm.
Makassar, S. W. Celebes; leg. D. M. Piller. — 5 specimens 72-82 mm.
Roads of Makassar; January, 1888; leg. J. Semmelink. — 9 specimens (6 ovigerous females) 57-71 mm.
Amboina; leg. D. J. Hoedt. — 2 specimens 86 and 88 mm.
Andai, N. New Guinea; 1870; leg. C. B. H. von Rosenberg. — 4 specimens 55-70 mm.
Hollandia, North New Guinea; freshwater near the bivouac; New Guinea Expedition, 1910-1911. — 2 specimens 77-87 mm.
Hollandia, N. New Guinea; May 15, 1911; New Guinea Expedition, 1910-1911. — 1 specimen 61 mm.
Locality unknown. — 5 specimens (2 ovigerous females) 56-89 mm.

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Durban; 1894; leg. M. Weber. — 1 specimen 88 mm.
Umgeni River near Durban; 1894; leg. M. Weber. — 1 specimen 46 mm.
Atjeh, N. Sumatra; leg. Capt. Storm; coll. J. G. De Man. — 4 specimens 44-66 mm.
Nias, off westcoast of Sumatra;leg.J . P. Kleiweg de Zwaan. — 49 specimens (8 ovigerous females) 42-96 mm.
River near Batavia; 1896; leg. A. G. Vorderman; cotype of *Palaemon sundaicus* var. *batavianus* De Man. — 1 ovigerous female 85 mm.
Sunter River near Batavia. — 1 specimen 61 mm.
Java Sea; leg. Capt. Storm; coll. J. G. de Man. — 1 specimen 80 mm.
Ampenan, Lombok, Lesser Sunda Islands; May, June, 1909; leg. G. F. Tydeman. — 4 specimens 59-86 mm.
Raka-mbaha (= Mbawa), Flores; in river close near the sea; 1888-1889; leg. M. Weber. — 2 specimens (1 ovigerous female) 37 and 64 mm.
Balikpapan, E. Borneo; leg. W. J. Tissot van Patot. — 4 specimens (3 ovigerous females) 45-76 mm.
Balikpapan, E. Borneo; leg. L. G. M. Rutten. — 3 specimens 48-64 mm.
River near Palopo, Luwu, Central Celebes; 1888-1889; leg. M. Weber. — 2 specimens 35 and 36 mm.
River near Parepare, S. W. Celebes; 1888-1889; leg. M. Weber. — 1 specimen 36 mm.
Waterfall Bantimurong near Maros, S. W. Celebes; 1888-1889; leg. M. Weber. — 1 specimen 63 mm.
Balangnipa, S. W. Celebes; 1888-1889; leg. M. Weber. — 11 specimens (1 ovigerous female) 26-65 mm.

Ondolean, E. Celebes; December 18, 1904. — 4 specimens 54-88 mm.
Ternate; pool in dry bed of a rivulet; February 1, 1903; leg. L. F. de Beaufort. — 2 specimens 69 and 98 mm.
Batjan; 1884; leg. S. C. J. W. van Musschenbroek. — 2 specimens 46 and 71 mm.
Merdika, Amboina; December 6 and 7, 1909; leg. L. F. de Beaufort. — 4 specimens 34-55 mm (1 bopyrized).
Lorentz (= Noord) River, S. W. New Guinea; May 4, 1907 and September 3, 1909; leg. H. A. Lorentz; New Guinea Expeditions, 1907 and 1909. — 5 specimens (1 ovigerous female) 63-80 mm.
Varen River, tributary of Lorentz River, S. W. Guinea; May 3, 1907; leg. H. A. Lorentz; New Guinea Expedition, 1907. — 9 specimens (5 ovigerous females) 43-94 mm.
Merauke, S. W. New Guinea; leg. J. W. R. Koch; New Guinea Expedition, 1905. — 59 specimens (including ovigerous females) 24-76 mm.
Mouth of Merauke River, S. W. New Guinea; leg. J. W. R. Koch; New Guinea Expedition, 1905. — 15 specimens (3 ovigerous females) 43-77 mm.

I am not certain whether the specimens from Bantimurong, Parepare and Palopo really belong to the present species. The hepatic spine namely is placed distinctly below the antennal. The specimens are too young, however, to make certain identification possible, I therefore follow De Man in bringing these specimens to the present species.

Cowles (1915) gives an extensive description of the present species, which fits for most of my specimens. I only will add the following details: The hepatic and antennal spines lie in one line; the hepatic spine lies close behind and below the antennal. The antennal spine generally continues posteriorly in a rather strong carina, which almost reaches the hepatic spine.

The abdomen is normal in shape. The fifth segment has the pleura ending in a rounded to rather acute apex, the sixth segment is slightly longer to 1.3 times as long as the fifth. The telson is provided with the usual dorsal and posterior spines.

The scaphocerite (fig. 36a) is 3.5 to 4 times as long as broad. The outer margin is somewhat concave. The final tooth is strong, but is distinctly overreached by the lamella.

The oral parts are quite typical.

The first pereiopod reaches with about 1/3 of the carpus beyond the scaphocerite in adult males, in young specimens only with the chela. The fingers are as long as the palm. The carpus is twice as long as the chela. The merus measures 3/4 of the length of the carpus. The second pereiopods are extensively described by Cowles. In some of my old specimens the palm is fully twice as long as the fingers. The last three pereiopods (fig. 36b) reach with the dactylus beyond the scaphocerite, in young specimens the third pereiopod fails to reach the end of the scaphocerite. In Cowles's remark: "In older individuals as much as one-fifth or one-third of the dactyli may extend beyond [the scaphocerite].", probably the word "dactyli" is used instead of propodi, as in my old specimens the dactylus and a part of the propodus reach beyond the scaphocerite.

The pleopods and uropods are normal in shape.

The present species is best known under the name *Palaemon sundaicus,* but as already pointed out before (p. 131), the specimens described by Heller (1862) as *Palaemon sundaicus* are identical with *Palaemon dispar* and *Macrobrachium australe.* The name *sundaicus* therefore may not be used for the present species. In my opinion there is little doubt that the specimen described by Dana (1852) as *Palaemon equidens* from Singapore is identical with *Palaemon sundaicus* auctt. (non Heller). The rostrum of Dana's specimen shows the characteristic upwards curved

shape and the rostral formula is the same as that of *P. sundaicus* auctt. Furthermore the hepatic spine lies in one line with the antennal. In literature only two species of *Macrobrachium* have been reported from Singapore, namely *M. rosenbergii* and "*Palaemon sundaicus*", the latter being very common there. All these facts I think evidence enough to identify *Palaemon equidens* of D a n a with *Palaemon sundaicus* auctt., notwithstanding the structure of the carpus and chela of the second pereiopod of D a n a's specimen not being known. As D a n a's name is the oldest valid name available

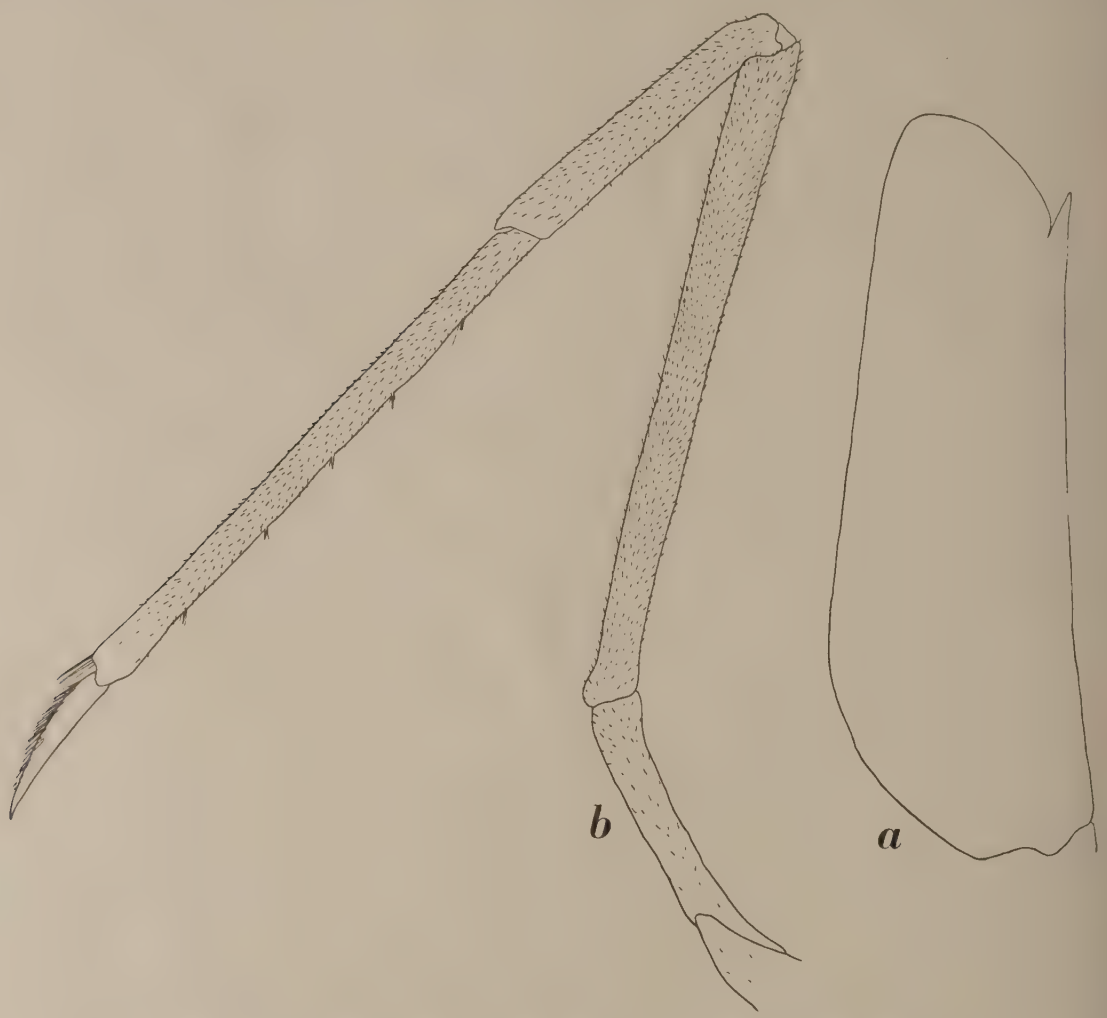

Fig. 36. *Macrobrachium equidens* (Dana). a, scaphocerite; b, third pereiopod of adult male. a, b, × 7.

for the present species, this species has to be named *Macrobrachium equidens* (Dana). The specimens referred by D e M a n (1888) to *Palaemon equidens* in all probability indeed belong here, those, however, which he in 1892 identifies with *P. equidens* are different and afterwards are placed by him in a new species *Palaemon neglectus* (vid. p. 191). In his 1892 paper D e M a n identifies specimens of the present species with *Palaemon sundaicus*, and he is the first to do so. In this respect he is followed by numerous later authors. At the same time, however, D e M a n (1897, p. 781) is the first to cast doubt on the correctness of this identification and already supposed the identity of *Palaemon sundaicus* with *P. dispar*: "Da nun beim Männchen der vorliegenden Art

[*Macrobrachium equidens*] die Finger dieselbe Bezahnung und Verhältnisse zeigen wie beim Weibchen (De Man, l.c. p. 438), so könnte es fraglich scheinen, ob die Heller'sche Art nicht mit *Pal. dispar* v. Mart. identisch wäre; in diesem Fall müsste die jetzt beschriebene einen neuen Namen empfangen, und es ist daher besser, ihr den Namen *sundaicus* zu lassen." Also Kemp (1918) pointed to the possible identity of *P. sundaicus* and *P. dispar.*

In literature many varieties of "*Palaemon sundaicus*" have been described, viz.: the varieties *bataviana* De Man (1897), *brachydactyla* Nobili (1899), *De Mani* Nobili (1899), and *baramensis* De Man (1902).

var. *bataviana* De Man. This variety is based on adult females of the present species originating from Batavia. The typematerial is at my disposal. The differences with the main form as stated by De Man are:

a. The rostrum is slightly longer.

b. The carpus of the second leg is $1^1/_3$ as long as the merus, not 1.5 times.

c. The palm of the second leg is slightly shorter than the merus (in the typical form it is as long as the merus).

d. The fingers of the larger second leg are provided with closely packed woolly hairs, while in the main form the fingers are smooth or bear only some scattered hairs.

e. The legs are slightly less slender than in the typical specimens.

In my material of the present species the rostrum is very variable in length, as is also found by Cowles in his specimens: it sometimes fails to reach the end of the scaphocerite, sometimes it just attains the end of that scale or distinctly overreaches it. Also the relation between the lengths of the carpus and of the merus and that between the palm and the fingers of the second legs is so variable that the above differences between the two forms fall within the range of variability of these characters in the present species, so that no varietal or subspecific value may be attached to it (cf. also Cowles's table of the lengths of the various joints in his material). The woolly hairs on the fingers are present in all full grown specimens of the present species, and the fact that they are not present in the "typical" specimens from the Java Sea examined by De Man is only due to the fact that these specimens (part of which could be examined by me) had not yet reached their final size. Also the slenderness of the legs is slightly variable in the present species, moreover the difference between the Batavia specimens and those from the Java Sea is very small in this respect. Summarizing we may conclude that the variety *bataviana* has no right of existence, as part of the so called differences fall within the range of variability of the species, and have no connection whatever with one another, while the other differences only are due to age. This also is confirmed by the fact that of the five specimens from the same locality four were brought by De Man to the variety *bataviana,* while the other was considered by him to be typical.

var. *brachydactyla* Nobili. The differences between this form and the typical "*Palaemon sundaicus* auctt." are, according to Nobili, the following:

a. The fingers of the second legs are very much shorter than the palm, the relation being $\frac{1}{2.2} - \frac{1}{2.3}$.

b. Hairs are present on the fingers of the second legs.

c. The merus shows more resemblance to that of the typical "*Palaemon sundaicus* auctt." than to the var. *bataviana.*

The first difference is largely due to age, in old specimens the fingers are much shorter in relation to the palm, than in young specimens. N o b i l i's specimen (a male) is old, this not only is obvious from the measurements given by N o b i l i, but also by the fact that the fingers are covered with woolly hairs. The variability of the relation between the lengths of the merus and carpus of the second legs has already been pointed out above. Thus also the variety *brachydactyla* can not be maintained as its differences are due to age or fall within the range of variability of the species.

var. *De Mani* Nobili. This variety is based by N o b i l i upon the specimens mentioned by D e M a n (1897) as *Palaemon* (*Eupalaemon*) *sundaicus* var. from Atjeh. Part of these specimens is present in the collection of the Amsterdam Museum and could be examined by me. The differences with the "typical form" as mentioned by D e M a n and N o b i l i are:

a. The specimens are smaller (ovigerous females of 45-52 mm), than in the typical form (70-82 mm).
b. Only 2 (seldom 3) teeth of the rostrum are placed behind the orbit (in the typical form always 3).
c. The carpus of the second leg is less slender, because it is more thickened anteriorly.
d. The palm is somewhat longer than the merus.

The length of ovigerous females is due to a considerable variation and often small females are found, which according to the various characters can not be considered adult, but nevertheless bear ova. The number of teeth of the upper margin of the rostrum, which are placed behind the orbit varies between 2 and 3, it is impossible, however, to divide the material in two groups according to this character as transitions occur (the third tooth may be placed slightly before, just over, or slightly behind the posterior margin of the orbit), which also is indicated by the fact that even in some of D e M a n's specimens three teeth are placed behind the orbit. The third difference too is of no varietal value as it falls within the range of variability of the species, which is confirmed by the fact that in D e M a n's specimen 3 of the variety the carpus shows the slender shape of the typical form. The variability of the relation between the length of the merus and the palm of the second legs has already been pointed at under var. *bataviana*. Like the two other varieties in my opinion var. *De Mani* can not be maintained.

var. *baramensis* De Man. D e M a n himself thought it doubtful that the erection of a new variety for his specimens from the Baram River (Sarawak) was justified. He gives the following differences with the typical form:

1. The rostrum is only slightly curved upwards at the apex.
2. The hepatic spine lies slightly lower than in the typical form.
3. The carpus of the second leg is almost twice as long as the merus.

The shape of the rostrum is variable in the present species, the tip sometimes is very strongly curved upwards, sometimes the upward curvature is much less distinct. The second point is of much more importance. In all my material of the present species the hepatic spine lies in one line with the antennal, generally being placed close behind it, in some cases, however, the hepatic spine is placed somewhat below the antennal but then always the two spines lie in one line and the posterior ridge of the antennal spine extends itself in the direction of the hepatic spine and reaches close to the latter. This perhaps also may be the case with D e M a n's specimens. The variability of the relation between the several joints of the second leg in the present species has already been pointed out before (p. 167). The fact that the material of D e M a n in all other respects, even in the bluish mottled colour of the fingers of the second leg (which is an important and constant character), agrees with *M. equidens*, makes it extremely probable that also the erection of the var. *baramensis* is not justified. Examination of the typematerial of this form is needed, however, to obtain final certainty.

Nobili (1899) described a species of the present genus from Papua under the name *Palaemon* (*Eupalaemon*) *acanthosoma,* he regarded this form with some doubt as a new species, as it was only represented in his material by a male, which missed the second pereiopods. De Man (1915) gave additional details and figures of Nobili's type. Nobili's description namely is very short and is not accompanied by figures. From De Man's extensive description and good figures of Nobili's type and of the specimen, which he identifies with Nobili's species, the identity of *Palaemon acanthosoma* with the present species can be made fully certain. Moreover I could examine De Man's specimens, which entirely confirmed the above supposition. J. Roux (1917) pointed to the identity of *Palaemon acanthosoma* and *P. sundaicus* var. *brachydactyla.*

Palaemon nasutus Nobili (1903a) from Singapore according to Nobili's description should only differ from *P. sundaicus* auctt. in the longer rostrum, in all other respects there is the closest affinity between the two forms. As already pointed out above the length of the rostrum of the present species is very variable and the character of a long rostrum can not be considered to be of specific or even varietal value as it is connected by all transitions with that of a short rostrum, as is distinctly shown by my material. *Palaemon nasutus* Nobili therefore must be considered a synonym of *Macrobrachium equidens.*

In their 1910 paper Henderson & Matthai considered *Palaemon sundaicus* Heller to be identical with *Palaemon idae* of the same author and used the latter name for a species, which however in reality is neither *Palaemon sundaicus* nor *P. idae,* but is *Macrobrachium idella* (Hilg.). Nevertheless the present species is represented in their material, but was considered by them to be a new species, which they gave the name *Palaemon sulcatus*; from the good description and figures the identity of *Palaemon sulcatus* Henderson & Matthai [1]) with *Macrobrachium equidens* (Dana) is clearly shown. J. Roux (1917) already pointed to the close resemblance between *Palaemon sulcatus* H. & M. and *Palaemon acanthosoma* Nobili.

The specimens brought by Maki & Tsuchiya (1923) and Kubo (1940, 1941) to this species probably do not belong here. They may be young specimens of *Macrobrachium nipponense,* but the identity of the specimens can not be made out with certainty from the descriptions and figures given.

The specimen described and figured by De Man (1915) as *Palaemon* sp. from Hollandia, N. New Guinea could be examined by me and proved to be a specimen of the present species, which has the rostrum very long, resembling thereby *Palaemon nasutus* Nobili.

In 1915 Stebbing described a new species of the present genus from river estuaries at Delagoa Bay (Portuguese E. Africa). This species as may be concluded from Stebbing's rather short description and figures hardly can be anything else as *Macrobrachium equidens,* as is shown by the shape of the rostrum, and the position of the antennal and hepatic spines (in his fig. n.s., representing the entire animal, the hepatic spine is figured below the antennal, this obviously is incorrect as in figure car., showing the anterior part of the carapace in detail, the hepatic spine is situated in one line with the antennal, a situation so characteristic for *Macrobrachium equidens*), also the shape and the pubescence of the chelae are typical for *M. equidens.* I do not hesitate therefore to consider Stebbing's species to be identical with that latter species, the more as Barnard (1926)

1) The name *Palaemon sulcatus* is already used by Olivier (1811) for a species of Penaeidae (= *Penaeus kerathurus* (Forssk.) = *P. caramote* (Risso) = *P. trisulcatus* Leach).

reports "*Eupalaemon sundaicus*" from Delagoa Bay, and as I have examined several specimens of *M. equidens* from the Natal coast. The specimen from Kenya identified by Rathbun (1935) with Stebbing's *Palaemon delagoae* is, as far as may be concluded from Rathbun's remarks and figures, indeed identical with that and therefore also with the present species.

In a paper on Crustacea of Natal Stebbing (1923) described a new prawn from the Umhlotuzi River, which he named *Urocaridella borradailei*. His specimen, however, is no Pontoniid at all and also does not belong to *Urocaridella* (this genus, as is already pointed out on p. 30, is identical with *Leander* Desmarest and belongs to the Palaemoninae). *Urocaridella borradailei* belongs to the genus *Macrobrachium* as is immediately shown by the situation of the hepatic spine, by the fact that the mandible is provided with a threejointed palp, and by that the dactylus of the last three pereiopods is simple. Comparison of Stebbing's description and figures with the present species makes it clear that *Urocaridella borradailei* is nothing else than *Macrobrachium equidens* as is shown by the shape of the rostrum and the situation of the hepatic spine. Unfortunately the shape of the second pereiopods is unknown since they are missing in Stebbing's typespecimen. Barnard (1947) already pointed out that Stebbing's *Urocaridella borradailei* belongs to the present species.

In the collection of the Amsterdam Museum, material is preserved, which is identified by J. Roux and published by him in Nova Guinea and in Capita Zoologica. The material identified by Roux (1921, 1923) as *Palaemon sundaicus* proved to consist of specimens belonging to various species, namely to *Macrobrachium australe, M. mammillodactylus* and to *M. equidens*. His 1921 material originating from the Lorentz River (S.W. New Guinea) and consisting of females and young males, for the larger part belongs to *M. mammillodactylus,* large males of which species are reported by Roux from that region. Only some of the specimens really are *M. equidens,* all others belong to *M. mammillodactylus*. Of the specimens mentioned by Roux (1923) as *Palaemon* (*Eupalaemon*) *sundaicus,* only that from Amboina really is *M. equidens,* those from Ceram and most specimens from Waigeo belong to *M. australe,* while the female from the rivulet near Ga, Waigeo proved to belong to *M. mammillodactylus*. This confusion again proves the extreme difficulty to separate the females and young males of *M. australe, M. equidens* and *M. mammillodactylus*. *M. equidens* and *M. australe* may be best distinguished by the fact that in *M. equidens* the hepatic and antennal spine lie in one line, while in *M. australe* they are placed distinctly below each other and do not lie in one line, furthermore the scaphocerite in *M. equidens* is much more slender than that in *M. australe*. *M. equidens* and *M. mammillodactylus* show the following differences in their females and young males:

1. The rostrum of *M. mammillodactylus* generally bears more (11-13) dorsal teeth than that of *M. equidens* (generally 10 or 11), the teeth in the former species are more erect. The lower margin of the rostrum in *M. mammillodactylus* generally bears 3 or 4 teeth, that of *M. equidens* generally 5. The rostrum of *M. mammillodactylus* is higher and narrows more rapidly towards the apex.
2. The fingers of the second legs in *M. mammillodactylus* often are more slender than those of *M. equidens*.
3. The best character to separate the females and young specimens of the two species is the shape of the scaphocerite. In *M. equidens* the outer margin of the scaphocerite is straight or more or less concave, while in *M. mammillodactylus* it is somewhat convex.

These characters are often rather vague, but when used together they are sufficient to find the identity of the specimens.

The specimens from a river near Batavia collected by A. G. Vorderman (Museum Leiden and Amsterdam) have already been mentioned by De Man (1897), 4 of these specimens are cotypes of De Man's *Palaemon sundaicus* var. *bataviana.* The specimens from Hollandia, N. New Guinea (Museum Leiden) have been described by De Man (1915) as *Palaemon acanthosoma* and *Palaemon* sp. The specimens from Durban and neighbourhood (Museum Amsterdam) have been dealt with by M. Weber (1897) as *Palaemon sundaicus,* those from Atjeh in the same Museum, by De Man (1897) as *Palaemon* (*Eupalaemon*) *sundaicus* var., the latter are made by Nobili (1899) the types of a new variety *Palaemon* (*Eupalaemon*) *sundaicus* var. *De Mani.* The specimens from the Java Sea (Museum Amsterdam) are mentioned by De Man (1897) as *Palaemon sundaicus,* those from Flores and Celebes, collected by M. Weber are described by De Man (1892) as *P. sundaicus.* Other specimens from the Amsterdam Museum have been mentioned by J. Roux (1917), namely those from Ternate, Merauke and Tawarin as *Palaemon* (*Eupalaemon*) *sundaicus* and one from Ternate as *Palaemon* (*Eupalaemon*) *acanthosoma,* the specimens from the Lorentz and Varen Rivers are mentioned by J. Roux (1921) as *P. sundaicus,* those from Amboina by the same author (1923) under the same name.

Distribution: This very common species, which seems to be a typical inhabitant of brackish water, but also is found in salt and fresh water, is recorded in literature from: Ngatana, Tana River, Kenya (Rathbun, 1935), Zanzibar (Coutière, 1901), Uzaramo Province and Kongorambotto, E. Africa (Hilgendorf, 1898), Delagoa Bay, Portuguese E. Africa (Stebbing, 1915; Barnard, 1926), Umhlotuzi River, Natal (Stebbing, 1923), Umgeni River, near Durban (M. Weber, 1897), Durban (M. Weber, 1897), Umlaas River, Natal (Stebbing, 1915), Bay of Antongil, Madagascar (Coutière, 1900, 1901), Travancore (Nataraj, 1942), Cochin, S.W. India (Henderson & Matthai, 1910), Pondicherry (Nobili, 1903), Mergui Archipelago (De Man, 1888a), Singapore (Dana, 1852; Nobili, 1903a), Patani River, Siamese Malay States (Kemp, 1918a), Kuala Mabek, Jalor, Siamese Malay States (Lanchester, 1906), Tale Sap near Singora, Siamese Malay States (Kemp, 1918a), Patalung River, Siamese Malay States (Suvatti, 1937), Menam Chao Phya, Paknam near Bangkok, Siam (Suvatti, 1937), Bang-pla-soi, coast S.E. of Bangkok (Suvatti, 1937), Tachalom and Menam at Pakret, Siam (Suvatti, 1937), Chang Island, off Krat, Siam (Suvatti, 1937), Klong Raibon, Krat, Siam (Suvatti, 1937), Cochinchina (Nouvel, 1932), Amoy, China (Yu, 1931), ? Miyako and Iriomote, Riukiu Islands (Kubo, 1941), ? Formosa (Maki & Tsuchiya, 1923), ? Kotôhi and Tainan, Formosa (Kubo, 1940), Obando River near Manila, Luzon, Philippines (Cowles, 1915), Manila (Cowles, 1915), San Francisco River near Manila, Luzon (Cowles, 1915), Laguna de Bay, Luzon (Estampador, 1937), Baram River, Sarawak (De Man, 1902), Atjeh, N. Sumatra (De Man, 1897), near Padang, W. coast of Sumatra (J. Roux, 1932), Musi River near Muaraklingi, S. Sumatra (J. Roux, 1932), Java Sea (De Man, 1897), River near Batavia (De Man, 1897), Ampenan, Lombok (J. Roux, 1917), Rakambaha (= Mbawa), W. Flores (De Man, 1892), ? Palopo, Central Celebes (De Man, 1892), ? Parepare, ? Bantimurong and ? Balangnipa, S.W. Celebes (De Man, 1892), Makassar, S.W. Celebes (Rathbun, 1910), Ternate (J. Roux, 1917), Amboina (Nobili, 1899; J. Roux, 1917, 1923), Elat and Warkar, Groot Kai, Kai Islands (J. Roux, 1919), Wokam and Waskai, Wokam Island, Aru Islands (J. Roux, 1919), Hollandia, N. New Guinea (De Man, 1915), Tawarin River, Walckenaer Bay, N. New Guinea (J. Roux, 1917), Lorentz River and Varen River,

S.W. New Guinea (J. Roux, 1921), Merauke, S.W. New Guinea (J. Roux, 1917), Katau, Papua (Nobili, 1899), Omboi Islands, New Britain (J. Roux, 1934a).

Macrobrachium nipponense (De Haan)

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Palemon Nipponensis Herklots, 1861, Tijdschr. Ent., vol. 4, p. 145.
Palaemon sinensis Heller, 1862a, Verh. zool.-bot. Ges. Wien, vol. 12, p. 528.
Palaemon sinensis Heller, 1865, Reise Novara, Zool., vol. 2 pt. 3, p. 119, pl. 10 fig. 11.
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Palaemon Sinensis Von Martens, 1868, Arch. Naturgesch., vol. 34 pt. 1, p. 42.
Palaemon nipponensis De Man, 1879, Notes Leyden Mus., vol. 1, p. 175.
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Palaemon nipponensis Thallwitz, 1891a, Zool. Anz., vol. 14, p. 419.
Palaemon nipponensis De Man, 1892, Weber's Zool. Ergebn., vol. 2, p. 441.
Palaemon nipponensis Kitahara, 1895, Dobuts. Zass., vol. 7, pp. 77, 84.
Palaemon nipponensis Koelbel, 1897, Wiss. Ergebn. Reise Szechenyi, vol. 2, p. 567.
Palaemon nipponensis Koelbel, 1897a, Szechenyi's Kelet. Utaz., vol. 2, p. 709.
non *Palaemon nipponensis* Lanchester, 1901, Proc. zool. Soc. Lond., 1901 pt. 2, p. 566.
Palaemon nipponensis Thompson, 1901, Catal. Crust. Mus. Dundee, p. 19.
Palaemon nipponensis Doflein, 1902, Abh. Bayer. Akad. Wiss., vol. 21, p. 640.
Bithynis nipponensis Rathbun, 1902b, Proc. U.S. Nat. Mus., vol. 26, p. 53.
Palaemon nipponensis Ichô, 1912, Oyashiwo, n. 7, p. 1.
Palaemon nipponensis Balss, 1914, Abh. Bayer. Akad. Wiss., suppl. vol. 2 pt. 10, p. 59.
Palaemon nipponensis Kemp, 1918a, Mem. Asiat. Soc. Bengal, vol. 6, p. 258.
Palaemon (*Eupalaemon*) *nipponensis* Parisi, 1919, Atti Soc. Ital. Sci. nat., vol. 58, p. 80, pl. 6 fig. 2.
Palaemon (*Eupalaemon*) *superbus* Parisi, 1919, Atti Soc. Ital. Sci. nat., vol. 58, p. 81, pl. 4 fig. 2.
Macrobrachium nipponensis Maki & Tsuchiya, 1923, Rep. Dept. Agric. Formosa, vol. 3, p. 60, pl. 5 fig. 4.
Macrobrachium nipponensis Gee, 1925, Lingnaam agric. Rev., vol. 3, p. 158.
Macrobrachium nipponensis Sowerby, 1925, Nat. Note-Book in China, pp. 133, 138.
Palaemon nipponensis Urita, 1926, Dobuts. Zass., vol. 38, p. 427.
Macrobrachium nipponensis Kellogg, 1928, Lingnan Sci. Journ., vol. 5, p. 352.
Palaemon nipponensis Yu, 1931, Bull. Soc. zool. France, vol. 56, p. 271.
Palaemon sinensis Ping, 1932, Peking nat. Hist. Bull., vol. 7, p. 169.
Palaemon nipponensis Ping, 1932, Peking nat. Hist. Bull., vol. 7, p. 169.
Macrobrachium nipponense Fish. Soc. Japan, 1935, Ill. Japan. aq. Plants Anim., vol. 2, pl. 59 fig. 1.
Macrobrachium nipponense Kubo, 1937, Bull. Japan. Soc. sci. Fish., vol. 5, p. 346, figs. 1A, 2A, 2B, 3A, 3B.
Palaemon nipponensis Kubo, 1940, Journ. Imp. Fish. Inst. Tokyo, vol. 34, p. 6, textfigs. 1, 2, pl. 1 fig. f.
Palaemon nipponensis Kubo, 1949, Bull. Japan. Soc. sci. Fish., vol. 15, p. 125, figs. 1-3.

Museum Leiden

Japan; cotypes of *Palaemon nipponensis* De Haan. — 12 specimens (4 ovigerous females) 61-99 mm.
Takao, S. Formosa; received May 9, 1908; leg. H. Sauter. — 3 specimens 44-61 mm.
Locality unknown. — 1 specimen 92 mm (dry).

This species has been often described and figured in literature (Ortmann, 1891; Parisi, 1919; Yü, 1931; Kubo, 1940). I only wish therefore to make the following remarks:

The scaphocerite is slender, it is almost thrice as long as broad. The outer margin is straight or slightly concave, the apex is rounded.

The antennule and the oral parts are typical, just like the pleopods.

The eggs are 0.4 to 0.6 mm in diameter.

The identity of *Palaemon asper* Stimps. and *P. sinensis* Heller with the present species has already been pointed out by older authors (De Man, Ortmann).

The specimens from Tale Sap (Siamese Malay States) identified by Lanchester as *Palaemon nipponensis* do not belong to the present species, but to *Macrobrachium sintangense* (vid. supra, p. 153), as is shown by the rostral formula $(\frac{6-11}{3-6})$ and the shape of the large second leg of the male specimens.

Parisi in his 1919 paper described and figured *Palaemon* (*Eupalaemon*) *superbus* from Southern China. These specimens certainly do not belong to *Macrobrachium superbum*, as is already remarked by Yu (1931). In my opinion they must be referred to the present species, with which they agree in all respects. The fact that Parisi's specimens from Southern China all are females, and that his Japanese specimens correctly referred by him to *P. nipponensis* all are males, probably is the cause that he overlooked their cospecificity.

The specimens from Japan in the collection of the Rijksmuseum van Natuurlijke Historie at Leiden are the cotypes of the present species; the material is in rather good condition. The dry specimen from an unknown locality also may have belonged to the type lot as many of the original labels of the old collection of dry Crustacea have been lost.

Distribution: *Macrobrachium nipponense* is very commonly met with in fresh waters of China and Japan (Ortmann, 1891, thinks it probable that his specimens were captured in brackish water). Records in literature are: China: Shanhaikwan and Chinwangtao, Hopeh Province, N. China (Yu, 1931), Peiping, Peiping Province (Doflein, 1902; Gee, 1925; Kellogg, 1928), Peh Tai Ho, Hopeh Province (Gee, 1925; Kellogg, 1928; Yu, 1931), Tsinan and Chefoo, Shantung Province (Yu, 1931), Chengtu, Szechwan Province (Yu, 1931), Shasi, upper Yangtsekiang, Hupeh Province (Doflein, 1902), Hankow, Hupeh Province (Yu, 1931), Yangchow, Chinkiang and Soochow, Kiangsu Province (Yu, 1931), Tai Hu Lake near Shanghai, Kiangsu Province (Kemp, 1918a), Shanghai, Kiangsu Province (Heller, 1862a, 1865; Von Martens, 1868; Doflein, 1902; Balss, 1914; Sowerby, 1925; Kellogg, 1928; Yu, 1931), Tsungming, Kiangsu Province (Yu, 1931), Hangchow, Chekiang Province (Koelbel, 1897), Kashing, Chekiang Province (Yu, 1931), Ningpo, Chekiang Province (Fauvel, 1880), Wenchow, Chekiang Province (Gee, 1925; Kellogg, 1928), Kiukiang and Nanchang, Kiangsi Province (Yu, 1931), Pei-chii [1]) (Yu, 1931), Foochow, Fukien Province (Kellogg, 1928), Min River, Fukien Province (Gee, 1925; Kellogg, 1928), Amoy, Fukien Province (Yu, 1931), Canton, Kwantung Province (Stimpson, 1860), West Lake (Yu, 1931), S. China (Parisi, 1919), Annam (Thallwitz, 1891a).

Japan: Japan (De Haan, 1849; Herklots, 1861; De Man, 1879; Kingsley, 1882; Thompson, 1901; Fish. Soc. Japan, 1935), Kasumiga-ura, N. of Tokyo (Kitahara, 1895;

1) The exact position of this locality is not known to me

Ichô, 1912; Kemp, 1918; Kubo, 1949), Tokyo Bay (Ortmann, 1891; Balss, 1914), Yokohama (VonMartens, 1868; Parisi, 1919), Turumi-gawa, Kanagawa Prefecture (Kubo, 1940), Fukuura, Sagami Bay (Balss, 1914), Hamanako, Sizuoka Prefecture, and Miya, Aiti Prefecture (Kubo, 1940), Wakanoura, Kii Province (Rathbun, 1902b), Yodo River near Osaka (Kemp, 1918), Asaki River near Okayama, Hondo (Balss, 1914), Yukuhasi, Fukuoka Prefecture, Kyushyu (Kubo, 1940), Chikugo River near Kurume (Rathbun, 1902b), Kurume, Kyushyu (Rathbun, 1902b).

Formosa: Formosa (Maki & Tsuchiya, 1923), Keelung River near Tamsui, N. Formosa (Balss, 1914).

Macrobrachium mirabile (Kemp)

Palaemon mirabilis Kemp, 1917, Rec. Indian Mus., vol. 13, p. 227, pl. 10.
Palaemon mirabilis Kemp, 1917a, Rec. Indian Mus., vol. 13, p. 234.
Palaemon mirabilis Sewell, 1934, Rec. Indian Mus., vol. 36, pp. 54, 55.
Macrobrachium mirabilis Suvatti, 1937, Check-List aq. Fauna Siam, p. 49.

Siboga Expedition

Station 82, Batupangal, Lower Mahakam River, E. Borneo; June 15 and 16, 1899. — 11 specimens 28-46 mm.

Museum Amsterdam

Sibpur near Calcutta, Hooghly River; January, 1917; leg. S. Kemp; coll. J. G. de Man; paratypes of *Palaemon mirabilis* Kemp. — 6 specimens 24-52 mm.

My specimens entirely agree with Kemp's extensive description and fine figures of this characteristic species.

The pleopods of the males present the normal shape.

The specimens from Sibpur formed part of the material on which Kemp's original description is based.

Distribution: *Macrobrachium mirabile* lives in brackish waters. It is recorded in literature from several localities in the Hooghly district, Ganges delta; off Cowcolly Lighthouse, mouth of Damodar River, Trebeni, Hooghly Nulla and Sibpur (Kemp, 1917), from various localities in the Gangetic delta: Sandheads, Port Canning, Shela in Khulna District, and Barisal (Kemp, 1917), Pazudaung and Dala Creeks, Rangoon, Burma (Kemp, 1917), Moulmein River, Burma, (Kemp, 1917), Chao Phya River, Menam at Pakret and Menam at Paknam, Siam (Suvatti, 1937). The present record of the species from E. Borneo forms a considerable extension of the known range of distribution of the species.

Macrobrachium australiense nom. nov.

Palaemon n.sp.? De Man, 1887a, Zool. Jb. Syst., vol. 2, p. 711, fig. 4.
Palaemon sp.? Ortmann, 1891, Zool. Jb. Syst., vol. 5, p. 708.
Palaemon australis Ortmann, 1891, Zool. Jb. Syst., vol. 5, p. 709. (non Guérin, 1838).
Palaemon australis Ortmann, 1894, Denkschr. med.-naturw. Ges. Jena, vol. 8, p. 17.
Palaemon australis McNeill, 1926a, Aust. Encycl., vol. 2, p. 325, fig.
Palaemon australis Hale, 1927, Crust. S. Aust., vol. 1, p. 60, fig. 56.
Palaemon australis Hale, 1927a, Trans. Roy. Soc. S. Aust., vol. 51, p. 309.
Palaemon (*Parapalaemon*) *australis* McNeill, 1929, Rec. Aust. Mus., vol. 17, p. 144, pl. 35.
Palaemon australis J. Roux, 1933a, Rev. Suisse Zool., vol. 40, p. 344.

Museum Leiden

Sydney; leg. R. Schütte. — 1 specimen 115 mm.
Rockhampton, Queensland; Mus. Godeffroy. — 1 specimen ±2 mm.
Peak Downs, Queensland; Mus. Godeffroy. — 2 specimens 40 and 42 mm.
Locality unknown; Mus. Godeffroy. — 2 specimens 46 and 48 mm.

Museum Amsterdam

Pallal, Horton river, near Bingara, New S. Wales; 1910; don. A. R. McCulloch; coll. J. G. de Man. — 5 specimens 24-81 mm.

The present species has been extensively described by M c N e i l l (1929), who also provided good figures.

The scaphocerite is more than 2.5 times as long as wide. The outer margin is about straight, sometimes being slightly concave or slightly convex.

The oral parts are normal in shape.

The fingers of the first leg are about as long as the palm, the carpus is twice as long as the chela. The merus measures $^4/_5$ of the length of the carpus. The third leg just reaches beyond the scaphocerite. The propodus is 2.5 times as long as the dactylus and twice as long as the carpus. The merus is slightly longer than the propodus. The fifth leg just fails to reach the end of the scaphocerite. The relation between the joints is the same as that of the third leg, though the joints themselves are more slender. The legs are provided with some short scattered hairs, while the usual spines are present on the posterior margin of the propodus; no other spines are observed on these legs.

The pleopods and uropods are normal in shape.

This species was first mentioned in literature by D e M a n (1887a), who had a specimen with a damaged rostrum at his disposal. D e M a n, though describing and figuring his specimen, did not give it a specific name because his material was too small. The first to give the species a name was O r t m a n n (1891), who, having examined several young specimens, described them as *Palaemon* sp.?, but gave in the text the name *Palaemon australis* for the case his material should belong to a new species. This name is used by all subsequent authors. *Palaemon australis* Ortmann (1891), however, is not valid as it is preoccupied by the name *Palaemon australis* Guérin (1838), which belongs to the species inserted in the present paper under the name *Macrobrachium australe* (Guérin) (= *Palaemon dispar* Von Mart.). O r t m a n n's species therefore needs another name, for which I should like to propose *Macrobrachium australiense* nom. nov., as the species seems to be confined to the Australian continent.

The specimen from Sydney (Museum Leiden) was provided with the label "*Palaemon ruber* Hess var. digitis inermatis. type." This certainly is not correct as the type of H e s s's *Palaemon ruber* is a *Macrobrachium lar,* which originated from the Fiji Islands. It also is not the specimen from Sydney described by D e M a n (1887) as *Palaemon* n. sp.?, and which according to D e M a n was inserted in the collection of the Göttingen Museum under the name *Palaemon ruber* Hess; the rostrum in my specimen namely is normal in shape.

The specimens from Rockhampton and Peak Downs were obtained by the Leiden Museum from the Museum Godeffroy, from which Museum the Strassbourg Museum also purchased specimens from the same localities, which became the types of the present species. In all probability the specimens of the Strassbourg and Leiden Museums have formed part of the same lot.

The specimens of the Amsterdam Museum were presented in 1910 by Mr. A. R. McCulloch to Dr. J. G. de Man. In his 1929 paper McNeill published the letter of De Man to McCulloch concerning these animals.

Distribution: The species is only known from freshwater of the Australian continent. Records in literature are: Katherine River, Northern Territory (J. Roux, 1933a), Peak Downs, Rockhampton and Gayndah, E. Queensland (Ortmann, 1891), Burnett, S.E. Queensland (Ortmann, 1894), Pallal, Horton River, northern New S. Wales (McNeill, 1929), Sydney ? (De Man, 1887a), S. Australia (Hale, 1927), Kangaroo Island, S. Australia (Hale, 1927a).

Macrobrachium hildebrandti (Hilgendorf)

Bithynis? hildebrandti Hilgendorf, 1893, S. B. Ges. naturf. Fr. Berlin, 1893, p. 244.
Palaemon hildebrandti Calman, 1913, Proc. zool. Soc. Lond., 1913, p. 928, pl. 92.

This species has not been seen by me. It is extensively described and figured by Calman (1913).

Distribution: *Macrobrachium hildebrandti* is only known from Madagascar. It lives in fresh water. The records in literature are: Madagascar (Calman, 1913), Central Madagascar (Hilgendorf, 1893), Ambatonharanana, East Imerina and Betsileo, Central Madagascar (Calman, 1913).

Macrobrachium insulare (Parisi)

Palaemon (*Parapalaemon*) *insularis* Parisi, 1919, Atti Soc. Ital. Sci. nat., vol. 58, p. 85, textfig. 7, pl. 3 figs. 2, 3, pl. 6 fig. 12.

Macrobrachium insulare is only known from the type specimens reported by Parisi (1919) to originate from Formosa.

Macrobrachium lar (Fabricius) (fig. 37)

Palaemon Lar Weber, 1795, Nomencl. Entom., p. 94 (nom. nud.).
? *Palaemon longimanus* Weber, 1795, Nomencl. Entom., p. 94 (nom. nud.).
Palaemon Lar Fabricius, 1798, Suppl. Ent. Syst., p. 402.
? *Palaemon longimanus* Fabricius, 1798, Suppl. Ent. Syst., p. 402.
Palaemon lar Bosc, 1801, Hist. nat. Crust., vol. 2, p. 104.
? *Palaemon longimanus* Bosc, 1801, Hist. nat. Crust., vol. 2, p. 104.
Palaemon lar Latreille, 1802, Hist. nat. Crust. Ins., vol. 6, p. 258.
? *Palaemon longimanus* Latreille, 1802, Hist. nat. Crust. Ins., vol. 6, p. 258.
Palaemon Lar Olivier, 1811, Enc. méth. Hist. nat., vol. 8, p. 659.
Palaemon ornatus Olivier, 1811, Enc. méth. Hist. nat., vol. 8, p. 660.
? *Palaemon longimanus* Olivier, 1811, Enc. méth. Hist. nat., vol. 8, p. 661.
Palaemon ornatus Latreille, 1818, Tabl. enc. méth., vol. 24, p. 5, pl. 318 fig. 1.
Palemon ornatus H. Milne Edwards, 1837, Hist. nat. Crust., vol. 2, p. 396.
? *Palemon longimanus* H. Milne Edwards, 1837, Hist. nat. Crust., vol. 2, p. 396.
Palémon Lar H. Milne Edwards, 1837, Hist. nat. Crust., vol. 2, p. 397.
Palaemon ornatus Guérin, 1838, Voy. Coquille Zool., vol. 2 pt. 2 n. 1, p. 36.
? *Palaemon ornatus* Cantor, 1842, Ann. Mag. nat. Hist., vol. 9, p. 491.
Palaemon ornatus White, 1847, List Crust. Brit. Mus., p. 78.
Palaemon tridens (Leach MSS) White, 1847, List Crust. Brit. Mus., p. 78.
? *Palaemon longimanus* White, 1847, List Crust. Brit. Mus., p. 78.
Palemon ornatus De Haan, 1849, Siebold's Fauna Japonica, Crust., pl. P.

Palaemon ornatus Bleeker, 1856, Reis Minahassa Moluksche Arch., vol. 1, p. 273; vol. 2, p. 64 (as *Palaemon ornatus*).
Palaemon vagus Heller, 1862, S. B. Akad. Wiss. Wien, vol. 45 pt. 1, p. 417, pl. 2 figs. 42, 43.
Palaemon equidens Heller, 1862, S. B. Akad. Wiss. Wien, vol. 45 pt. 1, p. 418, pl. 2 fig. 44 (non Dana, 1852).
Palaemon spectabilis Heller, 1862 a, Verh. zool.-bot. Ges. Wien, vol. 12, p. 527.
Palaemon vagus Heller, 1865, Reise Novara, Zool., vol. 2 pt. 3, p. 113.
Palaemon spectabilis Heller, 1865, Reise Novara, Zool., vol. 2 pt. 3, p. 113, pl. 10 fig. 8.
Palaemon ornatus Heller, 1865, Reise Novara, Zool., vol. 2 pt. 3, p. 119.
Palaemon ruber Hess, 1865, Arch. Naturgesch., vol., 31 pt. 1, p. 165, pl. 7 fig. 20.
Palaemon ornatus Von Martens, 1868, Arch. Naturgesch., vol. 34 pt. 1, p. 36.
Palaemon ornatus Semper, 1868, Proc. zool. Soc. Lond., 1868, p. 586.
Palaemon mayottensis Hoffmann, 1874, Rech. Faune Madagascar, vol. 5 pt. 2, p. 32, pl. 9 figs. 61, 62.
Palaemon reunionnensis Hoffmann, 1874, Rech. Faune Madagascar, vol. 5 pt. 2, p. 33, pl. 9 figs. 66, 67.
Palaemon longimanus Hoffmann, 1874, Rech. Faune Madagascar, vol. 5 pt. 2, p. 34, pl. 9 figs. 68, 69.
Palaemon madagascariensis Hoffmann, 1874, Rech. Faune Madagascar, vol. 5 pt. 2, p. 35, pl. 7 fig. 58.
Palaemon ornatus Von Martens, 1876, Preuss. Exped. Ost-Asien, Zool., vol. 1, p. 315.
Palaemon ornatus Miers, 1876, Catal. Crust. New Zeal., p. 87.
Palaemon ornatus De Man, 1879, Notes Leyden Mus., vol. 1, p. 168.
Palaemon mayottensis De Man, 1879, Notes Leyden Mus., vol. 1, p. 173.
Palaemon Reunionnensis De Man, 1879, Notes Leyden Mus., vol. 1, p. 174.
Palaemon ornatus Miers, 1879, Philos. Trans. Roy. Soc. Lond., vol. 168, p. 493.
Palaemon Lenz & Richters, 1881, Abh. Senckenb. naturf. Ges., vol. 12, p. 427.
non *Palaemon ornatus* Haswell, 1882, Catal. Aust. Crust., p. 196.
Palaemon longimanus Kingsley, 1882, Bull. Essex Inst., vol. 14, p. 108.
Palaemon ornatus Filhol, 1885, Bibl. Éc. haute Étud., vol. 30 pt. 2, p. 52.
Palaemon ornatus Filhol, 1886, Miss. Ile Campbell, Zool., vol. 2 pt. 2, p. 434.
Palaemon ruber De Man, 1887 a, Zool. Jb. Syst., vol. 2, p. 710.
Bithynis lar Bate, 1888, Rep. Voy. Challenger, Zool., vol. 24, p. 789, pl. 129 fig. 1.
Palaemon ornatus vagus De Man, 1888, Arch. Naturgesch., vol. 53 pt. 1, p. 554.
Palaemon ornatus Osorio, 1888, Jorn. Sci. math. phys. nat. Lisboa, vol. 12, p. 240.
Palaemon ornatus Hickson, 1889, Natural. N. Celebes, pp. 105, 362.
Palaemon lepidodactylus p.p. Pfeffer, 1889, Jb. Hamb. wiss. Anst., vol. 6 pt. 2, p. 34.
Palaemon ruber Ortmann, 1891, Zool. Jb. Syst., vol. 5, p. 705, pl. 47 fig. 3.
Palaemon lar Ortmann, 1891, Zool. Jb. Syst., vol. 5, p. 724.
Palaemon (*Eupalaemon*) *lar* De Man, 1892, Weber's Zool. Ergebn., vol. 2, p. 445.
Palaemon spectabilis Koelbel, 1892, in De Man, Weber's Zool. Ergebn., vol. 2, p. 446 footnote.
Palaemon equidens Koelbel, 1892, in De Man, Weber's Zool. Ergebn., vol. 2, p. 456 footnote.
Palaemon (*Eupalaemon*) *lar* De Man, 1893, Notes Leyden Mus., vol. 15, p. 305.
Palaemon lar Sharp, 1893, Proc. Acad. nat. Sci. Philad., 1893, p. 123.
Palaemon lar Ortmann, 1894, Denkschr. med.-naturw. Ges. Jena, vol. 8, p. 17.
Palemon ornatus Casto de Elera, 1895, Catal. Faun. Filip., vol. 2, p. 568.
Palaemon lar Borradaile, 1898, Proc. zool. Soc. Lond., 1898, p. 1008.
Palaemon (*Eupalaemon*) *lar* Hilgendorf, 1898,Deutsch O. Afr., vol. 4 pt. 7, p. 31.
Palaemon lar Borradaile, 1899, Willey's Zool. Res., vol. 4, p. 409.
Palaemon (*Eupalaemon*) *lar* Nobili, 1899, Ann. Mus. Stor. nat. Genova, vol. 40, p. 240.
Palaemon (*Eupalaemon*) *vagus* Nobili, 1899, Ann. Mus. Stor. nat. Genova, vol. 40, p. 240.
Palaemon (*Eupalaemon*) *lar* Coutière, 1900, C. R. Acad. Sci. Paris, vol. 130, p. 1266.
Palaemon (*Eupalaemon*) *lar* Nobili, 1900, Ann. Mus. Stor. nat. Genova, vol. 40, p. 482.

Palaemon lar Coutière, 1901, Ann. Sci. nat. Zool., ser. 8 vol. 12, p. 292, pl. 12 figs. 25-28.
Palaemon lar Lenz, 1901, Zool. Jb. Syst., vol. 14, p. 436.
Palaemon lar Thompson, 1901, Catal. Crust. Mus. Dundee, p. 19.
Palaemon (*Eupalaemon*) *lar* De Man, 1902, Abh. Senckenb. naturf. Ges., vol. 25, p. 774.
Palaemon lar Schenkel, 1902, Verh. naturf. Ges. Basel, vol. 13, p. 505.
Palemon lar Seurat, 1903, Bull. Mus. Hist. nat. Paris, vol. 9, p. 223.
Palemon lar Seurat, 1903 a, Bull. Mus. Hist. nat. Paris, vol. 9, p. 381.
Palaemon lar Seurat, 1903 b, Bull. Soc. ent. France, 1903, p. 246.
Bithynis ornatus Thomson, 1903, Trans. Linn. Soc. Lond. Zool., ser. 2 vol. 8, p. 451.
Palaemon (*Eupalaemon*) *lar* De Man, 1904, Trans. Linn. Soc. Lond. Zool., ser. 2 vol. 9, p. 291, pl. 18 fig. 1.
Palaemon (*Eupalaemon*) *lar* Lenz, 1905, Abh. Senckenb. naturf. Ges., vol. 27, p. 380.
Palaemon (*Eupalaemon*) *reunionnensis* De Man, 1905, Notes Leyden Mus., vol. 26, p. 204, pl. 15 figs. 1-4.
Palaemon lar De Man, 1905, Notes Leyden Mus., vol. 26, p. 205, pl. 15 fig. 5.
Palaemon (*Eupalaemon*) *lar* var.? De Man, 1905 a, Proc. zool. Soc. Lond., 1905 pt. 2, p. 544, pl. 18.
Palaemon lar Nobili, 1905 a, Ann. Mus. nat. Hungar., vol. 3, p. 481.
Leander dionyx Nobili, 1905 a, Ann. Mus. nat. Hungar., vol. 3, p. 482, pl. 12 fig. 2.
Palaemon (*Eupalaemon*) *lar* Borradaile, 1907, Trans. Linn. Soc. Lond. Zool., ser. 2 vol. 12, p. 67.
Palaemon ornatus Coulon, 1907, Bull. Soc. Étud. Sci. nat. Elbeuf, vol. 26, p. 191.
Palaemon (*Eupalaemon*) *lar* Nobili, 1907, Mem. Accad. Sci. Torino, ser. 2 vol. 57, p. 361.
Palaemon lar var. Calman, 1909, Proc. zool. Soc. Lond., 1909, p. 706.
Palaemon (*Eupalaemon*) *lar* Lenz, 1910, Voeltzkow's Reise O. Afr., vol. 2, p. 567.
Bithynis (*Eupalaemon*) *lar* Rathbun, 1910, Bull. Mus. comp. Zoöl. Harvard, vol. 52, p. 316.
Palaemon lar Koningsberger, 1913, Java zoöl. biol., p. 401.
Palaemon ornatus Baker, 1914, Trans. Roy. Soc. S. Aust., vol. 38, p. 447.
Palaemon lar Cowles, 1914, Philipp. Journ. Sci., vol. 9 sect. D, p. 380, pl. 2 fig. 7.
Palaemon lar Pesta, 1914, Denkschr. Akad. Wiss. Wien, vol. 89, p. 675.
Palaemon (*Eupalaemon*) *lar* De Man, 1915, Zool. Jb. Syst., vol. 38, p. 415.
Palaemon (*Macrobrachium*) *latimanus* J. Roux, 1917, Nova Guinea, vol. 5, p. 601.
Palaemon (*Eupalaemon*) *lar* J. Roux, 1919, Abh. Senckenb. naturf. Ges., vol. 35, p. 330.
Macrobrachium lar Maki & Tsuchiya, 1923, Rep. Dept. Agric. Formosa, vol. 3, p. 56, pl. 5 fig. 1.
Palaemon (*Eupalaemon*) *lar* J. Roux, 1923, Capita Zool., vol. 2 pt. 2, p. 9.
Palaemon lar Balss, 1925, Wiss. Ergebn. Valdivia Exped., vol. 20, p. 293.
Leander dionyx Kemp, 1925, Rec. Indian Mus., vol. 27, p. 294.
Palaemon (*Eupalaemon*) *lar* J. Roux, 1926, Nova Caledonia, Zool., vol. 4, p. 221.
Palaemon (*Eupalaemon*) *lar* J. Roux, 1927, Nova Guinea, vol. 15, p. 322.
Palaemon (*Eupalaemon*) *lar* J. Roux, 1928a, Treubia, vol. 10, pp. 213, 219.
Palaemon (*Eupalaemon*) *lar* J. Roux, 1929, S.B. Ges. naturf. Fr. Berlin, 1929, p. 236.
Palaemon lar Roxas, 1930, Puerto Galera mar. biol. Lab., p. 17.
Palaemon (*Eupalaemon*) *lar* J. Roux, 1932, Arch. Hydrobiol., suppl. vol. 11, p. 565.
Palaemon (*Eupalaemon*) *lar* J. Roux, 1933, Rés. Voy. Pr. Belg. Ind. or., vol. 3 pt. 14, p. 6.
Palaemon (*Eupalaemon*) *lar* J. Roux, 1934, Faune Colon. Franç., vol. 5, p. 531.
Palaemon (*Eupalaemon*) *lar* J. Roux, 1934a, Rev. Suisse Zool., vol. 41, pp. 217, 218, 219.
Palaemon lar Adamson, 1935, Occ. Pap. Bishop Mus. Honolulu, vol. 11 pt. 10, p. 17.
Palaemon (*Eupalaemon*) *lar* Boone, 1935, Bull. Vanderbilt mar. Mus., vol. 6, p. 150, pl. 38.
Palaemon lar Gordon, 1935a, Ann. Mag. nat. Hist., ser. 10 vol. 16, p. 629.
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Palaemon lar Adamson, 1939, Bull. Bishop Mus. Honolulu, vol. 159, p. 36.
Palaemon lar Kubo, 1940, Journ. Imp. Fish. Inst. Tokyo, vol. 34, p. 23, textfig. 14, pl. 2 figs. a-c.

Macrobrachium lar Armstrong, 1941, Amer. Mus. Novit., n. 1137, p. 12.
Palaemon lar Kubo, 1941, Trans. biogeogr. Soc. Japan, vol. 3, p. 312, fig. 6.
Palaemon longimanus Ward, 1942, Mauritius Inst. Bull., vol. 2, p. 58.
Palaemon lar Gibson-Hill, 1947, Bull. Raffles Mus., vol. 18, p. 44.
Macrobrachium lar Holthuis, 1949, Nova Guinea, n. ser. vol. 5, p. 291.

Siboga Expedition

Station 47, Bay of Bima, Sumbawa; reef; depth 55 m; bottom mud, with patches of fine coral sand; April 8-12, 1899. — 2 specimens 15 and 18 mm.
River near Station 121, Menado, N. Celebes; July 14-16, 1899. — 4 specimens (2 of which ovigerous females) 69-80 mm.
Station 131, Beo, Talaud Islands; July 24 and 25, 1899. — 7 specimens 60-91 mm (1 female bopyrized).
River near Station 180, northcoast of Kelang Island, W. of Ceram; September 4, 1899. — 1 specimen 102 mm.
River near Station 234, Nalahia Bay, Nusa Laut Island, S. of Ceram; November 19 and 20, 1899. — 18 specimens 57-125 mm.

Snellius Expedition

Mamudju, off the mouth of the Mamudju River; surface; August 4, 1929. — 1 specimen 17 mm.
Haruku; fresh water; May 3-7, 1930. — 10 specimens 90-140 mm.
Amboina; in rivulet; September 13, 1930. — 16 specimens 90-130 mm.
Morotai; October 2, 1930. — 19 specimens 47-156 mm.

Museum Leiden

Mayotta, near Madagascar; 1865; leg. F. P. L. Pollen & D. C. van Dam; cotypes of *Palaemon mayottensis* Hoffmann. — 9 specimens 71-124 mm.
Réunion; 1865; leg. F. P. L. Pollen & D. C. van Dam; cotypes of *Palaemon longimanus* Hoffmann. — 8 specimens 60-129 mm.
Réunion; 1865; leg. F. P. L. Pollen & D. C. van Dam; cotypes of *Palaemon reunionnensis* Hoffmann. — 11 specimens 115-131 mm.
We Island, northpoint of Sumatra; fresh water; 1906, 1907, January, 1913, November, 1919, September, 1922, November, 1923, February, 1924, March, July, and November, 1925, May, July, August, October and November, 1926, June, 1927, March, and October, 1930; leg. P. Buitendijk. — 108 specimens (including ovigerous females) 29-132 mm.
Padang, westcoast of Sumatra, and Timor. — 2 specimens 110 and 115 mm. (dry).
West Sumba, Lesser Sunda Islands; 1891; leg. H. ten Kate. — 3 specimens 62-102 mm.
Flores; leg. E. W. A. Ludeking. — 1 specimen 122 mm.
Besar Island (= Groot Bastaard), off N. E. Flores; 1891; leg. H. ten Kate. — 9 specimens (including 5 ovigerous females) 55-123 mm.
Wero River, near Atapupu, N. Dutch Timor, and Nefko Lake, near Kupang, S. Dutch Timor; 1891; leg. H. ten Kate. — 14 specimens (including 6 ovigerous females) 52-134 mm.
Atapupu, Timor; 1888-1889; leg. M. Weber. — 2 specimens 69 & 72 mm.
Timor; 1893; leg. H. ten Kate. — 1 specimen 83 mm.
River near Talae, Roti, S. of Timor; 1888-1889; leg. M. Weber. — 2 specimens (1 ovigerous female) 68 and 73 mm.
Roti, island S. of Timor; 1891; leg. H. ten Kate. — 7 specimens 46-68 mm.
Gorontalo Bay, E. Celebes. — 1 specimen 108 mm.
Celebes; April 14, 1878; leg. J. G. F. Riedel. — 1 specimen 99 mm.
Celebes; April 18, 1878; leg. C.B.H. von Rosenberg. — 2 specimens 50 and 87 mm.
Celebes; leg. E. A. Forsten. — 2 specimens 90 and 118 mm.

Tahuna, Sangihe Island, N. of Celebes; May and June, 1903; leg. E. E. W. Schröder. — 3 specimens (1 ovigerous female) 46-94 mm.
Sangihe Island; 1903; leg. E. E. W. Schröder. — 3 specimens 11-43 mm.
Tobelo, Halmahera, N. Moluccas; May, 1912; leg. A. Hueting. — 48 specimens (including 18 ovigerous females) 54-106 mm.
Halmahera; 1862; leg. H. A. Bernstein. — 8 specimens (1 ovigerous female) 58-93 mm.
Morotai, near Halmahera; 1862; leg. H. A. Bernstein. — 7 specimens 86-101 mm.
Ternate, Moluccas; leg. H. A. Bernstein. — 2 specimens 76 and 97 mm.
Gebe Island, E. of S. Halmahera; 1864; leg. H. A. Bernstein. — 1 ovigerous female 77 mm.
Sanana, Sula Islands; 1877; leg. J. E. Teysmann. — 9 specimens 53-99 mm.
Ceram or Lesser Sunda Islands; 1915; leg. J. M. Kampmeinert. — 1 ovigerous female 92 mm.
Seri, Amboina; found in large quantities out of the water on wet rocks in a rapidly flowing brook, near where it empties into the sea; June 25, 1922; leg. F. Kopstein. — 56 specimens 14-19 mm.
Amboina; in rapidly flowing mountain rivulets and waterfalls; October, 1922; leg. F. Kopstein. — 2 specimens 47 and 50 mm.
Amboina; 1877; leg. J. E. Teysmann. — 4 specimens (1 ovigerous female) 63-90 mm.
Groot Banda; fresh water; 1881; leg. J. Semmelink. — 1 specimen 84 mm.
Banda Sea; 1881; leg. J. Semmelink. — 38 specimens 21-98 mm.
Moluccas; 1844; leg. E. A. Forsten. — 2 specimens 131 and 161 mm.
Moluccas; 1895; leg. W. A. Moreaux. — 3 specimens 89-104 mm.
Andai, N. W. New Guinea; 1870; leg. C. B. H. von Rosenberg. — 1 specimen 82 mm.
Lower Sermowai River, N. New Guinea; in small rivulet, altitude about 70 m; April 9, 1911; New Guinea Expedition, 1910-1911; leg. K. Gjellerup. — 1 specimen 150 mm.
Korime River, near Nimburan, N. New Guinea; fresh water; September, 1910; New Guinea Expedition, 1910-1911; leg. K. Gjellerup. — 1 specimen 109 mm.
Tarfia, N. New Guinea; in fresh water; September, 1910; or, Armo River near Jakari; August 28, 1910; New Guinea Expedition, 1910-1911; leg. K. Gjellerup. — 1 specimen 87 mm.
Jaona, N. New Guinea; September, 1910; New Guinea Expedition, 1910-1911; leg. K. Gjellerup. — 7 specimens 57-109 mm.
Mbai River near Hollandia, N. New Guinea; fresh water; April and September, 1910; New Guinea Expedition, 1910-1911; leg. K. Gjellerup. — 13 specimens (1 ovigerous female) 75-114 mm.
Tributary of the Mbai river near its mouth; fresh water; New Guinea Expedition, 1910-1911; leg. K. Gjellerup. — 5 specimens (2 ovigerous females) 83-106 mm.
Hollandia, N. New Guinea; April 10 and May 15 and 19, 1911; New Guinea Expedition, 1910-1911; leg. K. Gjellerup. — 10 specimens 95-137 mm (1 bopyrized).
Mouth of river emptying into Kajo Bay (= Hollandia Bay), N. New Guinea; New Guinea Expedition, 1910-1911; leg. K. Gjellerup. — 10 specimens (2 ovigerous females) 85-117 mm.
Fate River near Hollandia, N. New Guinea; fresh water; New Guinea Expedition, 1910-1911; leg. K. Gjellerup. — 1 specimen 78 mm.
Zoutbron, 3° 1′ 13″ S, 140° 57′ 30″ E, N. New Guinea; New Guinea Expedition 1910-1911; leg. K. Gjellerup. — 1 specimen 98 mm.
Tjano River near Njao, N. New Guinea; June 15, 1910; New Guinea Expedition, 1910-1911; leg. K. Gjellerup. — 3 specimens (1 ovigerous female) 109-181 mm.
Indian Archipelago. — 3 specimens 98-123 mm.
Sydney?; leg. R. Schütte. — 1 specimen 102 mm.
New Caledonia. — 2 specimens 129 and 131 mm. (dry).
Pacific Ocean; Mus. Godeffroy. — 3 specimens 61-116 mm.
Locality unknown; 1844; leg. E. A. Forsten. — 1 specimen 165 mm.

Museum Amsterdam

Sabang Bay, We Island, off northpoint of Sumatra; leg. G. Herman. — 10 specimens (7 ovigerous females) 76-117 mm.

Sinabang, Simalur, off westcoast of Sumatra; January and February, 1913; leg. E. Jacobson. — 38 specimens (10 ovigerous females) 47-91 mm.

Lugu, Sinabang Bay, Simalur; February, 1913; leg. E. Jacobson. — 7 specimens (1 ovigerous female) 58-151 mm.

Tudju River, Simalur; April, 1913; leg. E. Jacobson. — 4 specimens 74-128 mm.

Lasikin, Simalur; April, 1913; leg. E. Jacobson. — 9 specimens (5 ovigerous females) 63-94 mm.

? Simalur; 1913; leg. E. Jacobson. — 1 specimen 125 mm.

Babi Island, 2° 7′ N, 96° 40′ E, off westcoast of Sumatra; fresh water; April, 1913; leg. E. Jacobson. — 12 specimens (4 ovigerous females) 96-131 mm.

Gunungsitoli, Nias, off westcoast of Sumatra; 1910; leg. J. P. Kleiweg de Zwaan. — 6 specimens (1 ovigerous female) 35-72 mm.

Lolowau, Nias; 1910; leg. J. P. Kleiweg de Zwaan. — 8 specimens (2 ovigerous females) 74-143 mm.

West Nias; leg. J. P. Kleiweg de Zwaan. — 17 specimens (6 ovigerous females) 39-89 mm.

Nias; 1910; leg. J. P. Kleiweg de Zwaan. — 68 specimens (1 ovigerous female) 33-128 mm.

Serdang, eastcoast of Sumatra; leg. van Dedem. — 2 specimens (1 ovigerous female) 81 and 93 mm.

Nusa Kambangan, island off the southcoast of Java; in rivulet, fresh water; March, 1911; leg. E. Jacobson. — 21 specimens (2 ovigerous females) 33-108 mm.

Tjilatjap, southcoast of Java; leg. G. J. Terwiel. — 1 specimen 132 mm.

Guwa Ninggrong Cave in Gunung Sewu, Mula Subdistrict, near Jogjakarta, S. Java; in rivulet, fresh water; March, 1911; leg. E. Jacobson. — 7 specimens (5 ovigerous females) 69-146 mm.

Buleleng, Bali; January 25, 1907. — 1 specimen 86 mm.

West Sumba; October 18, 1932. — 1 specimen 71 mm.

Lahalura Island off S. E. Sumba; May 2, 1909. — 1 specimen 75 mm.

River near Reo, N. W. Flores; 1888-1889; leg. M. Weber. — 3 specimens 31-48 mm.

Alowai River, south of the village Papang, Riung district, northcoast of Flores; 40 m above sealevel; September 28, 1908; leg. G. A. J. van der Sande. — 5 specimens 89-138 mm.

Raka-mbaha (= Mbawa), S. Flores; in river close near the sea; 1888-1889; leg. M. Weber. — 3 specimens 54-71 mm.

Raka-mbaha, S. Flores; upstreams of waterfalls; 1888-1889; leg. M. Weber. — 8 specimens (1 ovigerous female) 26-75 mm.

Wukur River near Sikka, S. Flores; 1888-1889; leg. M. Weber. — 1 specimen 40 mm.

Lela River near Sikka; 1888-1889; leg. M. Weber. — 5 specimens (3 ovigerous females) 54-67 mm.

Konga River, E. Flores; December 9, 1908 and October 30, 1909; leg. G. A. J. van der Sande. — 6 specimens (3 ovigerous females) 57-125 mm.

Rivulet near Lamuda, E. Flores; May 3, 1908; leg. G. A. J. van der Sande. — 10 specimens (1 ovigerous female) 23-72 mm.

Near Riangkami, Ilimandiri mountain, E. Flores; leg. G. A. J. van der Sande. — 2 specimens 50 and 77 mm.

Wure, westcoast of Adonara, island E. of Flores; November 12, 1908; leg. G. A. J. van der Sande. — 3 specimens 40-92 mm.

Tanahmerah, westcoast of Adonara; 1888-1889; leg. A. Wichmann. — 2 specimens 64 and 82 mm.

River near Atapupu, N. Dutch Timor; February 26, 1899; leg. A. Wichmann. — 11 specimens (3 ovigerous females) 34-102 mm.

Putain, Semanatung district, Central Timor; region of the sources of the Temutu River; about 600 m above sealevel. — 5 specimens 76-132 mm.

Koinino River near Kupang, S. Timor; March, 1889; leg. A. Wichmann. — 7 specimens 51-124 mm.

Koinino River near Kupang; August 21, 1909; leg. H. A. Lorentz. — 9 specimens 50-113 mm (1 specimen bopyrized).

River near Kupang; May 14, 1908; leg. G. A. J. van der Sande. — 1 specimen 120 mm.

River near Talae, Roti, S. of Timor; 1889; leg. A. Wichmann. — 6 specimens (2 ovigerous females) 61-94 mm.

Jer Lawi River, Babar, N.E. of Timor; 7 km from the mouth. — 6 specimens 74-95 mm.

River near Palopo, Luwu, Central Celebes; 1888-1889; leg. M. Weber. — 2 specimens 76 and 123 mm.

River near Parepare, S. W. Celebes; 1888-1889; leg. M. Weber. — 7 specimens 41-98 mm.

Kadjang, S. E. part of the S. W. peninsula of Celebes; in a brooklet; 1888-1889; leg. M. Weber. — 14 specimens 33-54 mm.

Bangkalan and Bonea Rivers, Salajar, off S. W. Celebes; 1888-1889; leg. M. Weber. — 3 specimens (2 ovigerous females) 72-93 mm.

River near Tobelo, Halmahera; leg. W. Kükenthal; coll. J. G. de Man. — 2 specimens 92 and 119 mm.

Patani, Halmahera; leg. W. Kükenthal; coll. J. G. de Man. — 1 specimen 120 mm.

Ternate; pool in the dry bed of a rivulet; February 1, 1903; leg. L. F. de Beaufort. — 3 specimens (1 ovigerous female) 63-91 mm.

River south of Labuha, Batjan, Moluccas; January, 1927; leg. H. T. de Booy. — 1 specimen 73 mm.

Batjan; 1884; leg. S. C. J. W. van Musschenbroek. — 5 specimens 65-140 mm.

Leksula, southcoast of Buru; March 2, 1921; Buru Expedition 1921; leg. L. J. Toxopeus. — 13 specimens 46-113 mm.

Makatita, S. E. Buru; in fast flowing water, in rather deep places; September 25, 1921; Buru Expedition 1921; leg. L. J. Toxopeus. — 1 specimen 120 mm.

Upper Tuba River, W. Ceram; February 27, 1910; leg. L. F. de Beaufort. — 14 specimens (1 ovigerous female) 41-114 mm.

Tuba River, W. Ceram; February, 1910; leg. L. F. de Beaufort. — 3 specimens 64-102 mm.

Rivulet near Kairatu, W. Ceram; February 28, 1910; leg. L. F. de Beaufort. — 4 specimens 67-84 mm (1 specimen bopyrized).

Upper Riuapa River, W. Ceram; February 22, 1910; leg. L. F. de Beaufort. — 1 specimen 118 mm.

Amboina; pond near the house of the governor; 1929; leg. W. G. N. van der Sleen. — 12 specimens (3 ovigerous females) 36-145 mm.

Amboina; 1910; leg. L. F. de Beaufort. — 1 specimen 120 mm.

Amboina; November, 1921-March, 1922;? leg. L. J. Toxopeus. — 2 specimens 63 and 66 mm (both bopyrized).

Waiho River, Waigeo; freshwater; upstreams of rapids; December 20, 1909; leg. L. F. de Beaufort. — 13 specimens (1 ovigerous female) 53-142 mm.

Mumes River, Waigeo; December 29 and 30, 1909; leg. L. F. de Beaufort. — 12 specimens 50-149 mm.

Rabiai River, Waigeo; December 31, 1909; leg. L. F. de Beaufort. — 3 specimens (1 ovigerous female) 80-112 mm.

Wai La River, Waigeo; January 18, 1910; leg. L. F. de Beaufort. — 2 specimens 91 and 125 mm.

Mamapiri Rivulet, westcoast of Geelvink Bay, N. New Guinea, 2° 24′ S, 134° 15′ E; July 20-30, 1903; New Guinea Expedition, 1903. — 17 specimens 51-97 mm.

Jende, Ron Island, W. Geelvink Bay, 2° 21′ S, 134° 31′ E; rivulet behind the house of the missionary; March 3, 1903; New Guinea Expedition, 1903. — 3 specimens 69-96 mm.

Abu, southcoast of Geelvink Bay, 3° 12′ S, 134° 50′ E; August 15, 1903; New Guinea Expedition, 1903. — 1 specimen 123 mm.

Tawarin River, emptying in Walckenaer Bay, N. New Guinea, 1° 22′ S, 139° 47′.5 E; June 20, 1903; New Guinea Expedition, 1903. — 15 specimens (1 ovigerous female) 74-128 mm.

Klipong, rivulet at eastcoast of Tanahmerah Bay, N. New Guinea, 2° 46′ S, 140° 21′.6 E; July 9, 1903; New Guinea Expedition, 1903. — 5 specimens (1 ovigerous female) 76-134 mm.

Waitjiri River, N. New Guinea, 2° 26′.5 S, 140° 34′.5 E; May 23, 1903; New Guinea Expedition, 1903. — 13 specimens (3 ovigerous females) 31-74 mm.

Mbai River near Hollandia, N. New Guinea, 2° 32′ S, 140° 42.′5 E; fresh water; New Guinea Expedition, 1910-1911; leg. K. Gjellerup. — 1 specimen 116 mm.

Rivulet flowing in Kajo Bay (= Hollandia Bay); New Guinea Expedition, 1910-1911; leg. K. Gjellerup. — 2 specimens 87 and 104 mm.

Moso River, tributary of Tami River, N. New Guinea, 2° 30′ S, 140° 56′.5 E; May 9-12, 1903; New Guinea Expedition, 1903. — 5 specimens 80-112 mm.

Etna Bay, S. W. New Guinea, 3° 53'-4° S, 134° 28'-134° 52' E; 1905; New Guinea Expedition, 1905. 2 specimens 130 and 165 mm.
Indonesia; coll. J. G. de Man. — 2 specimens 105 and 127 mm.
North-East New Guinea. — 3 specimens 142-180 mm.
Locality unknown. — 6 specimens 96-141 mm.

This most common of the indo-westpacific species of the genus *Macrobrachium* has been extensively described by many authors as De Man (1892, 1902) and Cowles (1914). The following notes may be added:

The scaphocerite is about 2.5 times as long as broad. The outer margin is somewhat convex and ends in a final tooth, which is distinctly overreached by the lamella, which has the antero-internal angle rounded.

The oral parts are normal.

The first leg is slender and reaches with the chela and a small part of the carpus beyond the scaphocerite. The fingers are as long as the palm. The carpus is twice as long as the chela and about $^{9}/_{7}$ as long as the merus. The shape of the second legs has extensively been dealt with by other authors. The third leg reaches with part of the dactylus beyond the scaphocerite. The propodus is thrice as long as the dactylus and almost twice as long as the carpus. The merus is distinctly longer than the propodus. The fifth leg fails to reach the end of the scaphocerite. The propodus is more than thrice as long as the dactylus and fully twice as long as the carpus, while it is as long as the merus. All three legs in the adult males are covered with numerous spinules.

The pleopods and uropods are normal in shape.

The large variability of the present species and the large differences between specimens of different sex and age is the cause that numerous (about 10) species were described as new after specimens of this species. The identity of *Palaemon vagus, P. spectabilis, P. ruber, P. mayottensis, P. longimanus* Hoffm. (non Fabr.), and *P. madagascariensis* with *Palaemon lar* is generally accepted by most authors. Also *P. reunionnensis* Hoffm. is considered by several authors (e.g. Miers, 1880, Ortmann, 1891) to be a synonym of *P. lar.* De Man, however, in his 1905 paper still considers *P. reunionnensis* a local variety of *P. lar,* which should differ from the typical form by having:

1. the second legs equal.
2. the second legs more elongate.
3. three teeth of the upper margin of the rostrum behind the orbit.

I cannot agree with De Man, since in my material of *M. lar* these three characters vary so much and quite independant of each other, that even no varietal value can be attached to them. *P. reunionnensis* certainly cannot be considered a local variety as these characters occur in material from almost all localities. De Man in a footnote in his 1905 paper already states that he had examined a specimen from Halmahera with three teeth of the rostrum behind the orbit. I myself could examine the typematerial of *Palaemon reunionnensis,* which is present in the collection of the Rijksmuseum van Natuurlijke Historie at Leiden, and found the specimens to be indeed *Macrobrachium lar,* though they have the rostrum rather long, being generally longer than the rostrum of *Palaemon longimanus* Hoffm. from the same locality, but all transitions to shorter rostra occur, while in the material from the Malay Archipelago such long rostra also were observed.

De Man (1915) considers his specimens from Halmahera to belong to a variety different

from the typical form, by having more slender legs. This difference in my opinion is too small and too variable in the present species to be of varietal value. De Man fortunately does not give this "variety" a new name.

Also specimens from Christmas Island were considered by De Man (1905a) to form a variety different from the main species. I have not seen his material, but the following differences are given by De Man.

1. Christmas Island males have the second legs shorter than those of a specimen of the same size from Celebes.
2. The rostrum in the specimens from Christmas Island is shorter.

In my opinion these differences are too small even for the separation of a variety, as the rapidity of the development of the second legs in the male of most species of *Macrobrachium* is far from constant, in this regard we may point to the occurrence of the "mâles féminisés". Furthermore De Man states that he has examined specimens from Flores, which had the same shape as those from Christmas Island. That the length of the rostrum of the present species is very variable is distinctly shown in literature and by my material. None of De Man's varieties of *"Palaemon lar"* in my opinion has any right of recognition.

The description given by Fabricius of *Palaemon lar* runs as follows: "P. [alaemon] chelis porrectis aequalibus muricatis, rostro recto antennarum squamis aequante.

Habitat in India Dom. Daldorff.

Statura praecedentis [*Macrobrachium rosenbergii*] at paullo minor. Thorax laeuis antice utrinque dentibus duobus acutis. Rostrum compressum, rectum, serratum. Pedes muricati." This description very well fits for the present species, but it is so short that it equally well fits for others. Olivier (1811) gave a more extensive description of *P. lar* but this description too is insufficient for the certain recognition of the species. H. Milne Edwards (1837, p. 397) remarks that *P. lar* in all probability only is a variety of *P. ornatus,* which has the rostrum shorter than in the typical form. Bate (1888) is one of the first to synonymize *P. lar* and *P. ornatus,* using thereby the former name. No reasons are given by Bate for this identification. The majority of the authors after 1888 follow Bate in using Fabricius's name and for this reason I think it best to retain the name *lar* for the present species. The real identity of *Palaemon lar* never will be known with certainty, as the type specimens of all *Palaemon* species described by Fabricius are no longer extant, as the late Dr. K. Stephensen of the Zoological Museum at Copenhagen kindly informed me. As Fabricius's description gives no features with are in contrast with features of the present species, and as the latter very commonly occurs in the East Indies, there is in my opinion no objection whatever for the use of Fabricius's name.

Palaemon longimanus Fabr., which according to Fabricius should differ from *P. lar* by having the chelae smooth and unequal is identified by H. Milne Edwards (1837) with *P. ornatus,* while also Bate pointed to the possibility of the identity of *P. lar* and *P. longimanus.* No certainty, however, can be obtained in this respect. Kingsley (1882) identified both *P. lar* and *P. longimanus* with *P. ornatus,* he used the specific name *longimanus* for the species.

In the collection of the Leiden Museum two specimens were found bearing the label *"Palaemon ruber* Hess, type. Sydney. R. Schütte", these specimens were preserved in separate jars. They were presented to the Leiden Museum by the Göttingen Museum. Neither of the specimens, however, in reality is the type of *Palaemon ruber* Hess. One of them is *Macrobrachium australiense* nom. nov. (vid.

there, p. 175), the other indeed belongs to the present species, but it is not the type of *P. ruber,* because it possesses two normal second legs, and moreover does not originate from the Fiji Islands.

The specimens recorded by P f e f f e r (1889) as *Palaemon lepidodactylus* from Zanzibar, according to H i l g e n d o r f (1898), who examined them, in reality belong to *Macrobrachium lar.*

The specimen from Waitjiri River, N. New Guinea (Museum Amsterdam) was identified by J. R o u x (1917) as a juvenile specimen of *Palaemon latimanus*; examination of this specimen, however, showed that it is a juvenile *Macrobrachium lar.* In the collection of the Zoological Museum at Amsterdam numerous other specimens of *Macrobrachium lar* from the N. New Guinea Expedition 1903 were found; these specimens were identified by J. R o u x as *Palaemon lar,* but are not inserted in his (1917) paper on the Decapod Crustacea of this Expedition.

In 1905 N o b i l i described a new species of "*Leander*" from Stephansort, North-East New Guinea. This species is remarkable by the possession of a biunguiculate dactylus at the last three pereiopods and therefore was named by N o b i l i *Leander dionyx.* After N o b i l i's record the species was no more found. K e m p (1925) pointed out that the species does not belong to *Leander,* but he gave no suggestions as to the correct place of the species. In the Palaemonoid material examined by me a large number of specimens from Amboina (Museum Leiden), one from Mamudju (Snellius Expedition) and two from Sta. 47 of the Siboga Expedition proved to be perfectly identical with *Leander dionyx.* The rostrum (fig. 37a) of these specimens is rather high and compressed, it reaches beyond the antennular peduncle, but fails to reach the end of the scaphocerite. Its upper margin bears 8 to 10, its lower margin 2 to 3 teeth. In larger specimens these teeth are rather low, in smaller specimens they are more erect, especially those of the upper border. The first tooth of the upper margin is situated anterior of or slightly behind the posterior limit of the orbit. The distal teeth of the upper margin are placed closer together than the proximals. The carapace is smooth and bears an antennal spine and a spine on the anterior margin of the carapace; furthermore there is a blunt tubercle on the carapace above the orbit, this tubercle is best visible when the specimen is seen in dorsal view.

The abdomen is smooth. The pleurae of the first three segments are broadly rounded, those of the fourth and fifth segments are more acute. The sixth segment is more than twice as long as the fifth.

The telson is slender and is slightly shorter than the sixth abdominal segment. The dorsal surface bears two pairs of spines, which are situated in the middle and at $^3/_4$ of the length of the telson. The posterior margin of the telson ends in a median point which is flanked at each side by two spines, the inner of which is longest and overreaches the apex of the telson. Two feathered setae are present between the inner spines.

The eyes are well developed. The cornea is about as broad as and slightly shorter than the stalk. An ocellus is present, though it is not very distinct.

The first segment of the antennular peduncle is broad and bears a slender stylocerite, which fails to reach the middle of the segment. The anterolateral spine is well developed. The second segment is slightly shorter and broader than the third; together these two segments are about $^2/_3$ of the length of the basal joint. The upper antennular flagellum has the two rami fused for two joints; the shorter ramus has the free part consisting of 6 or 7 joints, being about three times as long as the fused part.

The scaphocerite reaches beyond the tip of the rostrum, it is rather narrow, its greatest breadth lies some distance above the base. The anterior margin is more or less truncate. The outer margin of the scaphocerite is straight and ends in a strong final tooth, which almost reaches the end of the

lamella. The antennal peduncle bears a small spinule, which only is visible as a triangular point, at the anterior margin of the second segment. The last segment of the peduncle is rather broad and almost reaches the middle of the scaphocerite.

The mandible (fig. 37b) bears a very small rudimentary palp, which consists only of one bud-like joint. The maxillipedes all are provided with epi- and exopods, they show the normal shape of the oral parts of *Macrobrachium* species. The third maxillipede fails to reach the end of the basal segment of the antennular peduncle. The ultimate segment is about as long as the penultimate.

Rudiments of exopods are present at the bases of the first four pereiopods. The first pereiopod (fig. 37c) reaches about to the end of the antennular peduncle. The fingers are slender and slightly

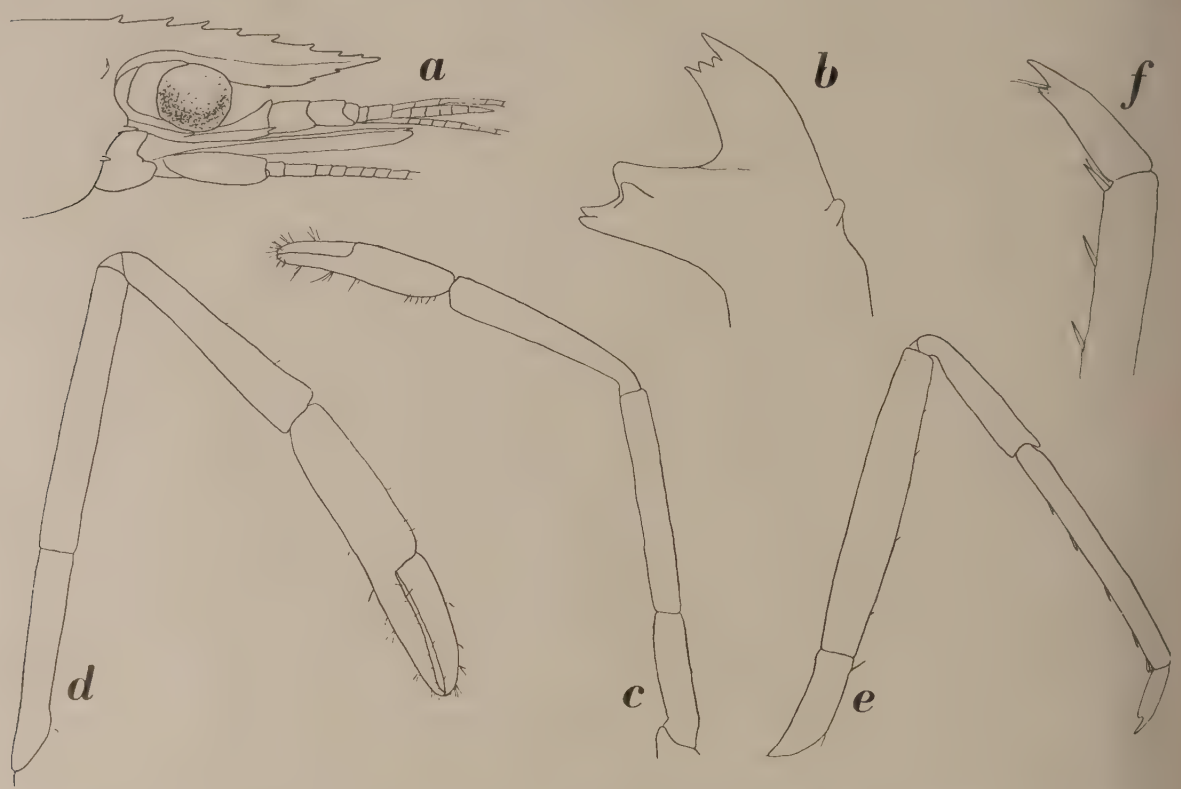

Fig. 37. *Macrobrachium lar* (Fabricius) *"dionyx"* stage. a, anterior part of body in lateral view; b, mandible; c, first pereiopod; d, second pereiopod; e, third pereiopod; f, dactylus of third pereiopod. a, × 15; b, × 75; c-e, × 30; f, × 60.

shorter than the palm. The carpus is longer than the chela and of about the same length as the merus. The ischium is slightly more than half as long as the merus. The second pereiopods (fig. 37d) are equal, they are stronger than the first pair. The fingers are slightly shorter than the palm, bear no teeth on the cutting edges and have the tips crossing. The carpus is longer than the palm, but shorter than the entire chela. The merus is longer than the carpus. The ischium is distinctly longer than half the merus. There are no spines or tubercles on any of the joints. The last three pairs of legs are equal in shape. The third leg (fig. 37e) reaches about to the end of the scaphocerite, the fifth does not reach further than the end of the first segment of the antennular peduncle. The dactylus (fig. 37f) is slender, it measures about $^1/_3$ to $^1/_4$ of the length of the propodus. The lower margin bears an accessory tooth in the distal half; this tooth is rounded. Some tufts of setae are present near the base of this accessory tooth. The propodus is slender and bears a row of spines along its posterior margin.

The carpus is half as long as the propodus. The merus is rather broad and is longer than the propodus, the ischium is short. The fifth pereiopod is somewhat more slender than the two preceding legs.

The first pleopod possesses a small endopod and a normally shaped exopod. In the other pleopods both endo- and exopod are well developed. The endopods of these last four pairs of pleopods each bear an appendix interna, no appendix masculina is present in any of my specimens.

The uropods are long and slender. The endopod reaches slightly beyond the end of the telson. The exopod is longer than the endopod. The outer margin of the exopod is straight and ends in a tooth, which at its inner side bears a movable spine.

These specimens now prove to be nothing else but the very young postlarval stages of *Macrobrachium lar*. In the large material at my disposal specimens of almost all sizes are present, so that one can follow the entire development of the species from specimens of 14-19 mm (dionyx stage) to the adult. In this series the supraorbital tubercle, which probably is the last remainder of the supraorbital spine of the larva, gradually disappears, the hepatic spine, which in the dionyx stage is placed on the anterior margin of the carapace gradually retreats posteriorly and finally attains its normal position below and behind the antennal spine, the mandibular palp becomes large and three-jointed, the accessory claw of the last pereiopods becomes smaller to disappear at last (sometimes vestiges of this claw are still visible in large specimens), etc. This development resembles in every respect that of *M. australe* and perhaps is present too in *M. latimanus*, the young specimens of which species at my disposal also have the hepatic spine placed close near the anterior margin of the carapace.

All the specimens of the dionyx stage in my material were found in or very close near the sea, which makes it very probable that the eggs are hatched in salt or brackish water, which is observed in many other species of *Macrobrachium* (cf. Kemp, 1915, p. 266). The occurrence of young specimens in the sea in all probability accounts for the large range of distribution of this species.

One of the specimens from the Siboga Station 131 was provided with a Bopyrid belonging to the species *Palaegyge bonnieri* Weber, and has already been mentioned by Nierstrass & Brender à Brandis (1923) in their paper on the Siboga Epicaridea.

The specimens from Mayotta and Réunion (Museum Leiden) are the types of *Palaemon mayottensis* Hoffmann, *P. longimanus* Hoffm. and *P. reunionnensis* Hoffm., they have been described in Hoffmann's (1874) paper and are discussed by De Man in his 1879 and 1905 articles. The specimens collected by Ten Kate at W. Sumba, Besar Island, Timor and Roti (Museum Leiden) are reported upon by De Man (1893), those from Flores (leg. Ludeking), Gorontalo, Halmahera (leg. Bernstein), Morotai (leg. Bernstein), Ternate, Gebe, Sanana (= Xulla Bessy), Amboina (leg. Teysmann), Moluccas (leg. Forsten) and Andai, all from the collection of the Leiden Museum are mentioned by De Man in his 1879 paper, those from N. Dutch New Guinea, collected by the New Guinea Expedition, 1910-1911, were reported upon by the same author (De Man, 1915). The specimens from the Pacific Ocean (Museum Leiden) in all probability formed part of the same set of material from which also the material of the Strassbourg Museum, described by Ortmann (1891) was obtained. The specimens collected by M. Weber and A. Wichmann in Flores, Adonara, Roti, Timor, Celebes, and Salajar have been dealt with by De Man in his 1892 paper. Those from Tobelo and Patani, Halmahera (Museum Amsterdam) by the same author (De Man, 1902). The specimens from Makatita (Buru), W. Ceram, Amboina (leg. De Beaufort) and Waigeo from the Amsterdam Museum have been inserted in J. Roux's (1923) paper.

Distribution. The species is a real freshwater form, though the postlarval stages have been found in sea and brackish estuaries. It is widely distributed throughout the indo-westpacific region from E. Africa to the Riukiu Islands and the Marquesas. The records in literature are: Zanzibar (Pfeffer, 1889; Hilgendorf, 1898; Lenz, 1905), Pemba, N. Mozambique (Lenz, 1910), Indian Ocean (H. Milne Edwards, 1837), East Indies (Fabricius, 1798; Bosc, 1801; Latreille, 1802; Olivier, 1811), Mahé Seychelles (Coutière, 1901; Borradaile, 1907; Balss, 1925), Praslin and Silhouette Islands, Seychelles (Borradaile, 1907), Mohilla, Comores (Lenz, 1910), Mayotta, Comores (Hoffmann, 1874; De Man, 1879), Madagascar (Coutière, 1900, 1901), Nosi Bé, N.W. Madagascar (Lenz & Richters, 1881; Lenz, 1905), Nosi Fali, N.W. Madagascar (Hoffmann, 1874), Majunga, N.W. Madagascar (J. Roux, 1934), Betampona forest near Tamatave, E. Madagascar (J. Roux, 1934), Réunion (Hoffmann, 1874; De Man, 1879, 1905), Saint Benoît and Marsouins River near Saint Benoît, Réunion (J. Roux, 1934), Mauritius (White, 1847; Heller, 1862; Miers, 1876; Ortmann, 1891; Sharp, 1893; Thompson, 1901), Tamarind Falls, Mauritius (Ward, 1942), Rodriguez (Miers, 1879), Pondicherry ? (White, 1847), Ganges River, India (Filhol, 1886), Nicobar Islands (Koelbel in De Man, 1892), Chusan, China ? (Cantor, 1842), Okinawa and Miyako, Riukiu Islands (Kubo, 1940, 1941), Isigaki and Iriomote, Riukiu Islands (Kubo, 1940, 1941), Yaéyama Group (Ohshima, 1935), Formosa (Maki & Tsuchiya, 1923), Rota Island, Marianas (Miyake, 1938), Guam, Marianas (Cowles, 1914), Palau Islands (Kubo, 1940), Philippines (Von Martens, 1868; Semper, 1868), Manila, Luzon (Casto de Elera, 1895), San Juan del Monte near Manila (Cowles, 1914; Estampador, 1937), Mariveles, Bataan Province, Luzon (Estampador, 1937), Puerto Galera, Mindoro (Cowles, 1914; Roxas, 1930; Estampador, 1937), Pasananca and Zamboanga, Mindanao, Philippines (Bate, 1888), Christmas Island, Indian Ocean (De Man, 1905a; Calman, 1909; Gibson-Hill, 1947), Sidney's Dale and Dolly Beach, Christmas Island (Gordon, 1935), Sumatra (Gordon, 1935), Lolomboli, Nias (Nobili, 1900), Soreino River, Mentawei (Nobili, 1900), Kifajuk and Buabua, Enggano (Nobili, 1900), near Padang, W. coast of Sumatra (J. Roux, 1932), Java (Koningsberger, 1913), Bali (Miers, 1880), Buleleng, Bali (Rathbun, 1910), Gitgit, Bali (J. Roux, 1929), West Sumba (De Man, 1893), Laora and Mao Marru, Sumba (J. Roux, 1928a), Flores (De Man, 1879), Rana Mese, W. Flores (J. Roux, 1928), Reo, W. Flores (De Man, 1892), Raka-mbaha (= Mbawa), S. Flores (De Man, 1892), Lela River near Sikka, S. Flores (De Man, 1892), Besar Island (= Groot Bastaard), off N.E. Flores (De Man, 1893), Adonara Island, E. of Flores (Von Martens, 1868), Tanahmerah, Adonara (De Man, 1892), Roti, near Timor (De Man, 1893), Talae, Roti (De Man, 1892), Timor (Osorio, 1888; De Man, 1893), Koinino River near Kupang, Timor (De Man, 1892), Kupang (Nobili, 1900), Atapupu, Timor (De Man, 1893), Baram River, N.W. Borneo (De Man, 1902), Minahasa, N. Celebes (De Man, 1902), Talise Island, N.E. Celebes (Hickson, 1889), Sawangan, Tondano River, N. Celebes (Von Martens, 1868), Menado (Schenkel, 1902), Kema, N. Celebes (Schenkel, 1902), Lolak River, N. Celebes (Schenkel, 1902), Gorontalo, N. Celebes (De Man, 1879), Matinan Mountain, N. Celebes (Schenkel, 1902), Randangan River (= Uangkahulu River), N. Celebes (Schenkel, 1902), between Borau and Manangalu, Luwu District, Central Celebes (Schenkel, 1902), Palopo, Luwu District (De Man, 1892), Enrekang, S.W. Celebes (Schenkel, 1902), Parepare, S.W. Celebes (De Man, 1892), Makassar, S.W. Celebes (Miers, 1880), Kadjang, S.W. Celebes (De Man,

1892), Bonea and Bangkalan Rivers, Salajar, off S.W. Celebes (De Man, 1892), Moluccas (De Man, 1879), Morotai, N. Moluccas (De Man, 1879), Halmahera (De Man, 1879, 1902), North Halmahera (De Man, 1902), Saluta and Tobelo, N. Halmahera (De Man, 1902), Oba, Central Halmahera (De Man, 1902), Gimia and Patani, S.E. Halmahera (De Man, 1902), Ternate (De Man, 1879, 1902), Batjan (De Man, 1902), Gebe (De Man, 1879), Sanana (= Xulla Bessy), Sula Islands (De Man, 1879), Makatita, Buru (J. Roux, 1928a), Riuapa River, Ceram (J. Roux, 1923), Tuba River, Ceram (J. Roux, 1923, 1928a), Kairatu, Ceram (J. Roux, 1923), Amboina (H. Milne Edwards, 1837; Bleeker, 1856; Heller, 1862; Von Martens, 1868, 1876; De Man, 1879, 1888; Ortmann, 1894; Nobili, 1899; J. Roux, 1923, 1928a), Banda (Bate, 1888), Erlalaan, Elat, Ohoinangan, Warkar and Waor, Groot Kai, Kai Islands (J. Roux, 1919), Udjir, Aru Islands (J. Roux, 1919), Ngaiguli, Trangan, Aru Islands (J. Roux, 1919), Waigeo, off N.W. New Guinea (H. Milne Edwards, 1837; Guérin, 1838; Bleeker, 1856), Mumes, Rabiai, Waiho and Wai Sa Rivers, Waigeo (J. Roux, 1923), Sorong, Doom Island, N.W. New Guinea (J. Roux, 1933), Andai, N.W. New Guinea (De Man, 1879; Nobili, 1899), Etna Bay, S.W. New Guinea (Holthuis, 1949), Pioneer Bivouac, Mamberamo River, N. New Guinea (J. Roux, 1927), Korime and Sermowai Rivers, N. New Guinea (De Man, 1915), between Walckenaer and Tanahmerah Bays, N. New Guinea (De Man, 1915), Jaona, N. New Guinea (De Man, 1915), Waitjiri River, N. New Guinea (J. Roux, 1917), Mbai River near Hollandia (De Man, 1915), Hollandia, N. Dutch New Guinea (De Man, 1915; J. Roux, 1927), Fate and Tjano Rivers, and Zoutbron, N.E. Dutch New Guinea (De Man, 1915), Stephansort, N.E. New Guinea (Nobili, 1905a), Moroka and Innawi, near Port Moresby, Papua (Nobili, 1899), Papua, between Cape Possession and East Cape, 9°-11° S, 146°-151° E (Ortmann, 1894), Manus, Admiralty Islands (J. Roux, 1934a), Likding and Poulos, New Hannover (J. Roux, 1934a), Bimoun, Medina, Laman, and Tabar Island, New Ireland (J. Roux, 1934a), Cape Gazelle, New Britain (Borradaile, 1899), Jacquinot Bay, New Britain (J. Roux, 1934a), Australia (Olivier, 1811; Semper, 1868; Miers, 1876), ? Running Waters and Hermannsburg, S. Northern Territory (Baker, 1914), Pacific Ocean (Ortmann, 1891), Auckland, New Zealand (Heller, 1865; Miers, 1876; Filhol, 1886; Thomson, 1903), various localities in New Caledonia (J. Roux, 1926), New Hebrides (Miers, 1876), Fiji (Hess, 1865; Semper, 1868; Miers, 1876; De Man, 1887a), Kandavu and Ovalau, Fiji (Bate, 1888), Tamavua River, Fiji (Borradaile, 1898), Samoa (Miers, 1879; Sharp, 1893; Lenz, 1901; Thompson, 1901; Pesta, 1914), Tahiti (Heller, 1862a, 1865; Seurat, 1903; De Man, 1904), Papeuriri, Tahiti (Bate, 1888), Vaituoru, Papenoo and Faa River, Tahiti (Nobili, 1907), Papeete and Venus Point Reef, Tahiti (Boone, 1935), Mangareva, Gambier Islands, Tuamotu Group (Seurat, 1903), Marquesas (Adamson, 1939), several localities in Hivaoa, Tahuata, Fatuhiva, Nukuhiva, Uapou, Uahuka and Eiao Islands, Marquesas (Adamson, 1935), ? Kapapa Islet, Oahu, Hawaiian Islands (Armstrong, 1941).

The records of the present species from Australia must be considered with some reserve, since in modern literature *Macrobrachium lar* has not been reported from that continent. The records in older literature may refer to *M. australiense* or to *M. novae-hollandiae* (so for instance Haswell's record of *"Palaemon ornatus"* from Australia, is based on specimens of *M. novae-hollandiae*). Olivier's specimen of *Palaemon ornatus* is a genuine specimen of the present species, but may have been wrongly labelled. Baker's (1914) record from Central Australia is based on larvae and there-

fore not certain. Also the record of the present species from Auckland, New Zealand (Heller, 1862, 1865) in all probability is incorrect as is already pointed out by Thomson (1903). Cantor's (1842) record of *"Palaemon ornatus"* from Chusan, China must be considered with much reserve, since no specimen of *M. lar* has ever been recorded from that region, from which many new species have been described after 1842; Cantor gives too little details to make certain identification possible.

Dr. Armstrong informs me that the specimen reported by him (Armstrong, 1941, p. 12) from the Hawaiian Archipelago, in all probability is incorrectly labelled, as Kapapa Islet, on which the specimen was said to be collected, contains no streams nor rivers capable of supporting so large a shrimp. He thinks it probable that the specimen in reality comes from Samoa. Up till now only *M. grandimanus* has been recorded from the Hawaiian Islands.

Macrobrachium javanicum (Heller) (fig. 38)

Palaemon javanicus Heller, 1862, S. B. Akad. Wiss. Wien, vol. 45 pt. 1, p. 421, pl. 2 fig. 48.
Palaemon javanicus Heller, 1865, Reise Novara Zool., vol. 2 pt. 3, p. 116.
? *Palaemon Javanicus* Von Martens, 1868, Arch. Naturgesch., vol. 34 pt. 1, p. 45.
Palaemon Javanicus De Man, 1879, Notes Leyden Mus., vol. 1, p. 180.
Palaemon acutirostris De Man, 1888a, Journ. Linn. Soc. Lond. Zool., vol. 22, p. 280, pl. 18 fig. 7. (non Dana, 1852).
Palaemon acutirostris Ortmann, 1891, Zool. Jb. Syst., vol. 5, p. 707 (non p. 728).
Palaemon javanicus Ortmann, 1891, Zool. Jb. Syst., vol. 5, p. 732.
Palaemon (*Eupalaemon*) *equidens* De Man, 1892, Weber's Zool. Ergebn., vol. 2, p. 453, pl. 26 fig. 37. (non Dana, 1852).
Palaemon (*Parapalaemon*) *javanicus* De Man, 1892, Weber's Zool. Ergebn., vol. 2, p. 457, pl. 26 fig. 38.
Palaemon (*Parapalaemon*) *javanicus* Nobili, 1900, Ann. Mus. Stor. nat. Genova, vol. 40, p. 483.
Palaemon equidens Lanchester, 1901, Proc. zool. Soc. Lond., 1901 pt 2, p. 565, pl. 34 fig. 4.
Palaemon (*Eupalaemon*) *neglectus* De Man, 1905, Notes Leyden Mus., vol. 26, p. 201, pl. 15 fig. 6.
Palaemon neglectus Kemp, 1918a, Mem. Asiat. Soc. Bengal, vol. 6, p. 265.
Palaemon (*Parapalaemon*) *javanicus* J. Roux, 1932, Arch. Hydrobiol., suppl. vol. 11, pp. 565, 571.
Macrobrachium neglectus Suvatti, 1937, Check List aq. Fauna Siam, p. 49.

Museum Leiden

Bay of Batavia, W. Java; July, 1938; leg. F. P. Koumans. — 1 specimen 58 mm.
Besuki, E. Java; leg. J. Semmelink. — 1 specimen 84 mm.
Java; leg. P. Bleeker. — 4 specimens (3 ovigerous females) 63-75 mm.

Museum Amsterdam

King Island, Mergui Archipelago; coll. J. G. de Man; cotype of *Palaemon neglectus* De Man. — 1 specimen 67 mm.
Batak Landen near Deli, N. E. Sumatra; in rivers and brooks; December 1, 1890; leg. Moesch; cotypes of *Palaemon neglectus* De Man. — 3 specimens 61-85 mm.
Sungai Pati Bubur near Airbangis, Padangsche Benedenlanden (Padang Lowlands), W. Sumatra; November, 1913; leg. E. Jacobson. — 1 specimen 94 mm.
River near Kajutanam, W. Sumatra; 1888-1889; leg. M. Weber. — 3 specimens 92-98 mm.
Sunter River near Batavia. — 2 specimens 82 and 83 mm.
River near Palopo, Central Celebes; fresh water; 1888-1889; leg. M. Weber. — 1 specimen 73 mm.
Locality unknown. — 16 specimens (7 ovigerous females) 54-105 mm.

The species has been extensively described by De Man (1888a, 1892, 1905) and Kemp (1918a). I only should like to add the following details:

The hepatic spine is placed closely below and distinctly behind the antennal, the two spines, however, are not placed in one line.

The abdomen is normal in shape, it has the apex of the pleurae of the fifth segment rounded. The sixth segment is 1.5 times as long as the fifth.

The telson is about 1.5 times as long as the sixth abdominal segment. It bears the usual two pairs of dorsal spines, which are placed in the middle and at 3/4 of the length of the telson. The posterior margin of the telson ends in a sharp median point, which is flanked by the usual two pairs of spines, the inner of which distinctly overreaches the apex.

The scaphocerite is 2.5 times to thrice as long as broad. Its outer margin is generally straight, sometimes it is more or less concave or even slightly convex, it ends in a strong final tooth, which fails to reach the end of the lamella. The lamella has its antero-internal angle somewhat produced.

The oral parts are quite normal.

The first pereiopod reaches with the chela and a very small part of the carpus beyond the scaphocerite. The fingers are as long as or a trifle shorter than the palm. The carpus is twice as long as the chela and is about 4/3 as long as the merus. In the adult males the ischium bears numerous spinules, which though less distinctly, also may be seen in the merus. The fingers of the second legs

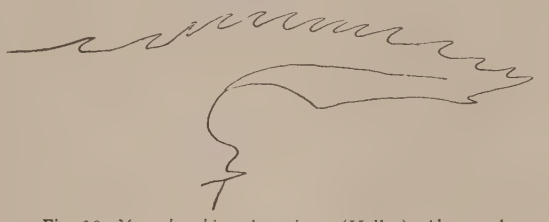

Fig. 38. *Macrobrachium javanicum* (Heller). Abnormal rostrum. × 5.

of the adult male have no tubercles along the distal part of the cutting edge as in *M. horstii,* though sometimes a row of spinules, as are present on the rest of the surface of the fingers, may be placed more or less close near the edge. The third leg fails to reach the end of the scaphocerite or just attains it. The propodus is 2.5 times as long as the dactylus and twice as long as the carpus. The merus is distinctly longer than the propodus, and about twice as long as the ischium. The fifth leg, though being more slender than the third, reaches slightly less far forwards. The propodus is as long as the merus, slightly less than twice as long as the carpus and thrice as long as the dactylus.

The pleopods and uropods are normal in shape.

The eggs are numerous and small, they are 0.4 to 0.6 mm in diameter.

One of the specimens collected by Bleeker is identified here with some doubt with the present species. It is an ovigerous female, which has the rostrum (fig. 38) directed straightly forward; the upper margin of the rostrum is convex, bearing 13 teeth, which are small and placed close together. It is possible, however, that this shape of the rostrum is abnormal, as the lower surface of that organ shows signs of damage. The second pereiopod of this specimen is like that of the other specimens of the present species.

The synonymy of the present species is rather intricate. Up till now *"Palaemon" javanicus* and *"Palaemon" neglectus* have been considered distinct species. The latter species has been identified by De Man (1888a) with Dana's *Palaemon acutirostris,* later by the same author (De Man, 1892) with *Palaemon equidens* Dana, to be at last described by him (De Man, 1905) as a new species.

I cannot agree with De Man in considering the forms indicated by him with the names *Palaemon javanicus* and *Palaemon neglectus* to be separate species. De Man himself already pointed to the close resemblance between them. The differences enumerated by De Man are:

1. In *P. neglectus* the carpus of the second legs is shorter than the merus, while in *P. javanicus* the carpus is the longer of the two.
2. The fingers of the second legs of the adult male of *P. neglectus* are differently dentate from those of *P. javanicus*, and they moreover are relatively shorter.
3. The palm of the large chela of adult males of *P. javanicus* is more compressed than in *P. neglectus*.

1. The first character is very variable, though in most of my material the carpus is equal to or somewhat longer (seldom somewhat shorter) than the merus, while in the type specimens of *P. neglectus* it is equal to or somewhat shorter than the merus (cf. the table below). Kemp (1918a)

material	sex	total length of body	length (in mm) of the second leg and its joints					
			leg	finger	palm	carpus	merus	ischium
Besuki	♂	84	66	10.5	18.0	15.5	14.0	10.0
			52	8.5	11.8	12.0	11.8	8.0
Java, Bleeker	♂	75	61	9.0	18.0	13.0	13.0	8.0
			47	7.0	11.0	11.0	11.0	7.0
	ov. ♀	65	35	5.0	7.0	8.0	8.0	6.0
	ov. ♀	58	46	8.0	11.5	11.0	7.5	7.0
Kajutanam	♂	98	70	10.0	18.5	15.0	14.5	10.0
			73	10.5	20.0	16.5	16.0	11.0
	♂	92	60	9.0	15.0	13.0	13.4	9.3
	♂	96	71	11.0	21.0	15.0	15.0	9.0
			57	9.0	14.0	13.0	12.5	9.0
Palopo	♂	73	80	12.0	24.0	17.5	17.5	9.5
			68	11.0	17.0	15.0	15.0	9.0
Sunter River	♂	82	79	11.5	21.0	17.5	17.0	8.0
	♂	83	104	15.0	30.0	24.0	23.0	12.0
			84	14.0	22.0	19.0	19.0	10.0
Sungai Pati Bubur	♂	94	108	17.0	29.0	25.0	24.0	14.0
			120	20.0	35.0	27.5	26.0	10.2
Mergui	♂	67	42	7.0	9.0	7.5	8.0	5.5
Batak	♂	84	81	14.0	22.0	18.0	19.0	10.0
			95	16.5	26.0	21.0	21.5	12.0
	♂	60	35	6.0	8.0	8.0	8.0	6.0
			36	6.0	8.0	7.0	7.5	5.0

in his material referred to *P. neglectus* found in the males the carpus as long as or somewhat shorter, in the females slightly longer than the merus. The character is very variable and in my opinion cannot be used for separating species.

2. As is shown by the table of measurements given by Kemp for his *Palaemon neglectus* specimens and by that given by me for my material, no constant differences can be observed in the relation between the length of the palm and the fingers of the second legs of the two forms. Furthermore it must be pointed at that in all probability in none of the known specimens of *P. neglectus*

the male has attained its full size, as in all specimens the large chela is shorter than the entire body. The only difference in the dentition of the fingers of both species as figured by De Man is that in *P. javanicus* the teeth are larger and placed slightly more anteriorly, but no difference could be found in this respect between the *P. neglectus* specimens and smaller specimens of *P. javanicus.*

3. The character of the more or less compressed shape of the palm too depends on the age of the specimens. In my material no difference in this respect can be observed between the *neglectus* and *javanicus* specimens.

Summarizing these results I come to the conclusion that I at present can find no reason whatever to treat *P. neglectus* and *P. javanicus* as two distinct species, more material, however, must decide in this question.

I am much in doubt about the correctness of the identification by Von Martens (1868) of his specimens from Central Borneo. In those specimens, measuring 74 mm, the rostral formula is stated to be $\frac{10-11}{4-6}$. Now in *M. javanicum* the rostrum bears generally three, seldom 4 lower teeth. I think it most probable that Von Martens's specimens belong to *Macrobrachium trompii,* a species, which shows the same rostral formula as Von Martens's animals and also in the other characters agrees with that material, it moreover is known from the region from where Von Martens reports his *Palaemon javanicus.* Von Martens's description is too short, however, to make certain identification possible.

The specimens of the Leiden Museum from Besuki and Java (leg. Bleeker) have already been mentioned by De Man (1879), those from Sumatra and Celebes collected by M. Weber (Museum Amsterdam) by the same author (De Man, 1892). The specimen from the Mergui Archipelago has been identified by De Man (1888a) as *Palaemon acutirostris* and later (De Man, 1905) has served that author for the description of his new species *P. neglectus,* just like the specimens from the Bataklanden, which De Man previously (1892) had described under the name *Palaemon equidens* Dana.

Distribution: This freshwater species has been recorded in literature from the following localities: King & Elphinstone Islands, Mergui Archipelago (De Man, 1888a, 1905), Penang (Kemp, 1918a), Kelantan, Malay Peninsula (Lanchester, 1901), Koh Chang, Siam (Suvatti, 1937), Bataklanden near Deli, N.E. Sumatra (De Man, 1892, 1905), Sibolga, N.W. Sumatra (Nobili, 1900; J. Roux, 1932), Kajutanam, W. Sumatra (De Man, 1892), Java (Heller, 1862, 1865; De Man, 1879), Besuki, E. Java (De Man, 1879), ? Danau Sriang, Upper Kapuas River, Central Borneo (Von Martens, 1868), Palopo, Central Celebes (De Man, 1892).

Macrobrachium asperulum (Von Martens) (fig. 39)

Palaemon asperulus Von Martens, 1868, Arch. Naturgesch., vol. 34 pt. 1, p. 43, pl. 1 fig. 5.
Palaemon asperulus Ortmann, 1891, Zool. Jb. Syst., vol. 5, p. 708.
Palaemon (*Parapalaemon*?) *asperulus* De Man, 1904, Trans. Linn. Soc. Lond. Zool., ser. 2 vol. 9, p. 293, pl. 18 figs. 2-8.
Palaemon asperulus Kemp, 1918a, Mem. Asiat. Soc. Bengal, vol. 6, p. 259, fig. 8.
Macrobrachium asperulus Maki & Tsuchiya, 1923, Rep. Dept. Agric. Formosa, vol. 3, p. 59, pl. 7 fig. 2.
Macrobrachium asperulus Gee, 1925, Lingnaam agric. Rev., vol. 3, p. 158.
Macrobrachium asperulus Sowerby, 1925, Nat. Note-Book in China, p. 133.

Macrobrachium asperulus Kellogg, 1928, Lingnan Sci. Journ., vol. 5, p. 352.
Palaemon superbus Derjavin, 1930, Hydrobiol. Zeitschr. biol. Wolgasta., vol. 9, p. 2.
Palaemon asperulus Yu, 1931, Bull. Soc. zool. France, vol. 56, p. 286, fig. 3.
Palaemon asperulus brevirostris Yu, 1931, Bull. Soc. zool. France, vol. 56, p. 287, fig. 4.
Palaemon asperatus Ping, 1932, Peking nat. Hist. Bull., vol. 7, p. 169.
Palaemon asperatus brevirostris Ping, 1932, Peking nat. Hist. Bull., vol. 7, p. 169.
Palaemon superbus Buldovsky, 1933, Bull. Far East. Br. Acad. Sci. U.S.S.R., 1933, p. 46, pl. 2 fig. 17.
Palaemon superbus Birstein & Vinogradov, 1934, Zool. Journ. Moscow, vol. 13, p. 43, fig.
Palaemon superbus Birstein, 1939, Zool. Journ. Moscow, vol. 18, p. 55.
Palaemon superbus Birstein, 1941, Life Freshwater U.S.S.R., vol. 1, p. 424.

Museum Amsterdam

Marsh near Tientsin, N. China; May, 1909; leg. Miss A. Hüllmann. — 1 specimen 36 mm.

The present specimen is referred with some doubt to *Macrobrachium asperulum,* to which species it at least is very closely related. Most of the descriptions of *Macrobrachium asperulum* in literature are so incomplete, that I can get no full certainty about the identity of my specimen, the more as this specimen seems to be not yet fullgrown. I therefore give here a complete description of the animal:

The rostrum (fig. 39a) is elongate and straight, it reaches to the end of the scaphocerite. The upper margin is slightly convex above the eyes and bears 13 teeth, the first two of which are placed on the carapace behind the orbit. The first tooth, which is placed at $^1/_3$ of the length of the carapace, is somewhat more distant from the second than the third is; above the eyes the teeth are placed slightly closer together. The lower margin of the rostrum bears three teeth. The carapace is smooth. The hepatic spine is almost as strong as the antennal and both spines lie in one line, the hepatic being placed behind and slightly below the antennal.

The abdomen is normal in shape. The pleura of the fifth segment is rounded. The sixth segment is almost twice as long as the fifth.

The telson is of the normal shape, it is elongate, being 1.5 times as long as the sixth abdominal segment. It bears two pairs of dorsal spines, which are placed respectively at the middle and at three quarters of the length of the telson. The posterior margin of the telson ends in an acute median point, which is flanked by two pairs of spines, a long inner pair, which overreaches the apex of the telson distinctly, and a short outer pair. Numerous feathered setae are present at the posterior margin of the telson.

The eyes are well developed and pigmented.

The antennulae are normal in shape.

The scaphocerite (fig. 39b) is somewhat more than 2.5 times as long as broad and is of about the same breadth throughout its entire length. The outer margin is straight and ends in a strong final tooth, which is outreached by the lamella, which is somewhat produced at its antero-internal angle.

The oral parts are typical.

The first pereiopods (fig. 39c) extend with the fingers only beyond the scaphocerite. The fingers are as long as the palm. The carpus is 1.5 times as long as the chela and about $^5/_4$ of the length of the merus. Only one of the second legs (fig. 39e) is present in my specimen, which is a female. It reaches with the chela beyond the scaphocerite. The fingers measure about $^5/_8$ of the length of

the palm. The dactylus bears two very small teeth in the proximal part of its cutting edge, while I could not detect any tooth on the fixed finger. Tufts of hairs are scattered over the fingers. The palm is cylindrical and is provided with some widely scattered hairs. The carpus is about 1.5 times as long as the palm. The merus is somewhat shorter than the carpus, while the ischium is about as long as the merus. The surface of the limbs is somewhat rugose. The last three legs are slender, the third (fig. 39d) distinctly fails to reach the end of the scaphocerite. The dactylus is long and slender, the propodus is twice as long as the dactylus, which is about as long as the carpus. The merus is somewhat longer than the propodus. The ischium is half as long as the merus. The fifth leg reaches somewhat beyond the third and just attains the apex of the scaphocerite. The propodus is slightly more than twice as long as the dactylus. The carpus is half as long as the propodus, while the merus

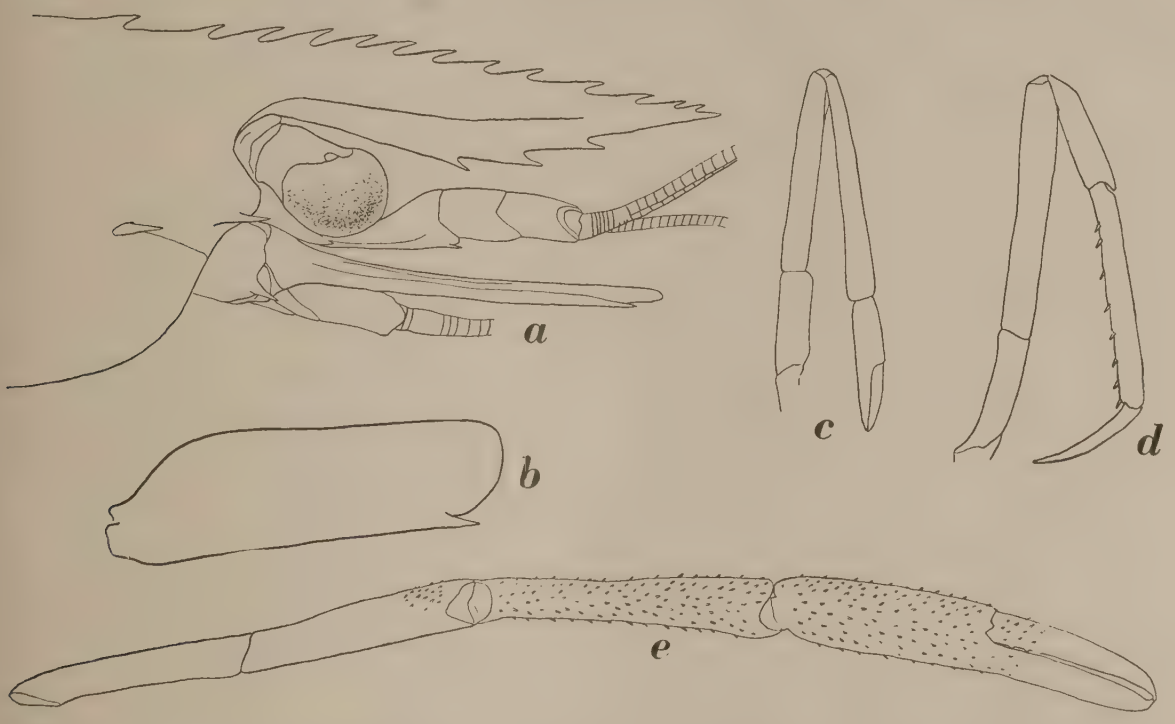

Fig. 39. *Macrobrachium ? asperulum* (Von Martens). a, anterior part of body in lateral view; b, scaphocerite; c, first pereiopod; d, third pereiopod; e, second pereiopod. a-c, e, × 10; d, × 14.

is as long as the latter joint. Except for the normal spinulation of the propodus no spinules are present on the various joints of the last three legs.

The uropods and pleopods are normal in shape.

In the shape of the rostrum, in the situation of the antennal and hepatic spines, and in the general shape of the second legs the present specimen resembles *M. asperulum,* with which species I have provisionally identified it. The fact that the fingers are relatively longer than for instance in K e m p ' s (1918) specimen may be due to the fact that my specimen is juvenile. The most striking feature in my specimen, in my opinion, is the very long and slender dactylus of the last three legs, which in the third leg is half as long as the propodus and in the fifth leg only relatively slightly shorter. Unfortunately in none of the descriptions of *M. asperulum* the length of the dactyli of the

last three legs is mentioned or figured, except in that of De Man (1904). The identity of De Man's (1904) specimen with the present species, however, is severely doubted by Kemp (1918), while Yu (1931) places that specimen in a separate variety, var. *brevirostris* of *M. asperulum*. De Man's specimen shows a short and broad dactylus of the third leg, which is about 1/3 as long as the propodus. According to Kemp (1918) the typical *M. asperulum* has the last three legs more slender than the form described by Dr. De Man, but he unfortunately does not give the relation between the length of the dactylus and the propodus in his material, nor a figure of one the last three legs. A decision in this question only can be reached after examination of more material of both forms, in adult and juvenile specimens. Then also the correct status of the var. *brevirostris* Yu can be decided; the characters on account of which Yu separates this variety from the typical form namely are rather vague and not very convincing, taking the variability of several of these characters in other *Macrobrachium* species into consideration.

The specimens recorded by Derjavin (1930), Buldovsky (1933) and by Birstein and Vinogradov (1934) from Lake Khanka in E. Siberia under the name *Palaemon superbus*, certainly do not belong to that species as is shown by the rostral formula of their specimens ($\frac{12-13}{3}$) and by the fact that the fingers of the second chela are distinctly shorter than the palm (cf. the description of *Palaemon superbus* given by Yu, 1931). It is far more probable that the specimens from Siberia belong to *M. asperulum*, or at least to the same species as my specimen from Tientsin, which in all respects agrees with Birstein & Vinogradov's figures. In the text the Russian authors state one tooth of the rostrum to be placed behind the orbit, while in their figure they show three teeth to be present there.

Distribution: The species lives in fresh water, often far from sea. It is recorded from: Khanka Lake, S.E. Siberia (Derjavin, 1930; Buldovsky, 1933; Birstein & Vinogradov, 1934; Birstein, 1941), Shanghai (Von Martens, 1868), Tai Hu Lake, near Shanghai (Kemp, 1918a; Kellogg, 1938), Soochow, Yangchow, Ihing and Chinkiang, Kiangsu Province (Yu, 1931), Kiukiang, Kiangsi Province (Yu, 1931), Ichang, Hupeh Province (Yu, 1931), Southern Hupeh Province (De Man, 1904), Changsha, Hunan Province (Yu, 1931), Fukien Province and southwards (Sowerby, 1925), Foochow and Yenping, Fukien Province (Gee, 1925; Kellogg, 1928), Formosa (Maki & Tsuchiya, 1923).

Macrobrachium altifrons (Henderson)

Palaemon altifrons Henderson, 1893, Trans. Linn. Soc. Lond. Zool., ser. 2 vol. 5, p. 444, pl. 40 figs. 4-6.

Macrobrachium altifrons, of which no material is at my disposal, has not been recorded after 1893. It is known from North India only, Henderson reported it from the following localities: Lahore, Jumna River and Delhi.

Macrobrachium kiukianense (Yu)

Palaemon kiukianensis Yu, 1931, Bull. Soc. zool. France, vol. 56, p. 279, fig. 1.
Palaemon kiukiangensis Ping, 1932, Peking nat. Hist. Bull., vol. 7, p. 169.

This species is only known from the specimen recorded by Yu from Kiukiang, Kiangsi Province, China.

Macrobrachium niloticum (P. Roux)

Palaemon Niloticus P. Roux, 1833, Ann. Sci. nat., vol. 28, p. 73, pl. 7 fig. 2.
Palaemon niloticus Heller, 1862, S. B. Akad. Wiss. Wien, vol. 45 pt. 1, p. 422.
Palaemon niloticus Klunzinger, 1866, Zeitschr. wiss. Zool., vol. 16, p. 358, pl. 20.
Palaemon Niloticus Von Martens, 1868, Arch. Naturgesch., vol. 34 pt. 1, p. 66.
Palaemon niloticus Ortmann, 1891, Zool. Jb. Syst., vol. 5, p. 704.
Palaemon niloticus Hilgendorf, 1898, Deutsch Ost-Afr., vol. 4 pt. 7, p. 33.
Palaemon niloticus Sollaud & Tilho, 1911, C. R. Acad. Sci. Paris, vol. 152, p. 1868.
Palaemon (*Eupalaemon*) *niloticus* J. Roux, 1927a, Denkschr. Akad. Wiss. Wien, vol. 101, p. 71.
Palaemon niloticus Gordon, 1933, Journ. Linn. Soc. Lond. Zool., vol. 38, p. 359, figs. 5-7.

There is no material of *Macrobrachium niloticum* at my disposal. The species is recorded in literature from: Nile (P. Roux, 1833), Nile near Qena, Upper Egypt (Klunzinger, 1866; Roux, 1927), Kurusku, Upper Egypt (Gordon, 1933), Blue Nile (Gordon, 1933), White Nile (Heller, 1862; Gordon, 1933), Tonga, White Nile (J. Roux, 1927a), Bahr el Jebel (Gordon, 1933), Lake Rudolf (Gordon, 1935), Lake Chad (Sollaud & Tilho, 1911).

Macrobrachium moorei (Calman)

Palaemon moorei Calman, 1899, Proc. zool. Soc. Lond., 1899, p. 709, pl. 40 figs. 20-24.
Palaemon moorei Thompson, 1901, Catal. Crust. Mus. Dundee, p. 19.
Palaemon Moorei Moore, 1903, Tanganyika Problem, p. 291, pl. 4 figs. 20-24.
Palaemon moorei Calman, 1906, Proc. zool. Soc. Lond., 1906, p. 188, pl. 11 fig. 1.
Palaemon moorei Cunnington, 1920, Proc. zool. Soc. Lond., 1920, p. 555.

This species, which is closely related to the preceding, is extensively described by Calman (1899, 1906). I have seen no material of it. It is recorded in literature from: Tanganyika Lake, E. Africa (Calman, 1899; Thompson, 1901; Moore, 1903; Cunnington, 1920), Niamkolo, Kalambo, Kirando, and Mrumbi, Tanganyika Lake (Calman, 1906).

Macrobrachium dayanum (Henderson)

Palaemon Dayanus Henderson, 1893, Trans. Linn. Soc. Lond. Zool., ser. 2 vol. 5, p. 443, pl. 40 figs. 7-13.
Palaemon dayanus Nataraj, 1942, Curr. Sci., vol. 11, p. 468.
Palaemon dayanus Chopra & Tiwari, 1949, Rec. Indian Mus., vol. 45, p. 215, fig. 1.

The species is known only from India. Henderson recorded it from: Lahore, Loodhiana, Hardwar, Roorki, Jumna River and Delhi, N.W. India, from Jubbulpur, Central India, from Orissa, Beerbhoom and Calcutta, N.E. India, and probably from the Dibru River in Assam. Chopra & Tiwari's specimens originate from Harishanker, Patna State, from the Varuna River at Benares, and from Sonarpur near Calcutta. Nataraj's material came from Travancore.

Macrobrachium callirhoë (De Man)

Palaemon (*Macrobrachium*) *callirhoë* De Man, 1898a, Notes Leyden Mus., vol. 20, p. 152, pl. 8.

Museum Leiden

Nangaraun, Mandai River, Central Borneo; 1894; Dutch Borneo Expedition; cotypes of *Palaemon callirhoë* De Man. — 3 specimens 31-37 mm.

Ketungau River, Central Borneo; 1894; Dutch Borneo Expedition; cotype of *Palaemon callirhoë* De Man. — 1 specimen 32 mm.

The scaphocerite is rather slender, being somewhat more than 2.5 times as long as broad. The outer margin is somewhat convex. The final tooth is strong and almost reaches to the end of the lamella, which has the antero-internal angle broadly rounded.

The oral parts and the pleopods are quite normal.

For the other characteristics I refer to the very extensive description made by De Man after the present material.

Distribution: The species is only known from the two above localities in the Kapuas basin (Central Borneo).

Macrobrachium petiti (J. Roux)

Palaemon (*Macrobrachium*) *Petiti* J. Roux, 1934, Faune Colon. Franç., vol. 5, p. 537, figs. 1-3.

Macrobrachium petiti has not been recorded since the publication of the original description. It is not represented in the collections studied by me. Roux's specimens originated from Vatomandry, E. Madagascar.

Macrobrachium sophronicum nom. nov. (fig. 40)

? *Palaemon gracilirostris* Miers, 1875, Ann. Mag. nat. Hist., ser. 4 vol. 16, p. 343.

? *Palaemon gracilirostris* Ortmann, 1891, Zool. Jb. Syst., vol. 5, p. 712.

Palaemon (*Parapalaemon*) *modestus* De Man, 1892, Weber's Zool. Ergebn., vol. 2, p. 469, pl. 27 fig. 43. (non *Palaemon modestus* (Heller, 1862)).

Palaemon (*Parapalaemon*) *modestus brevimanus* J. Roux, 1934a, Rev. Suisse Zool., vol. 41, p. 228, figs. 9, 10.

Palaemon modestus Kubo, 1941, Trans. biogeogr. Soc. Japan, vol. 3, p. 310, textfig. 4, pl. 20 fig. 2.

Museum Leiden

Batjan; 1884 leg. S. C. J. W. van Mussenbroek. — 1 ovigerous female 72 mm.

Air Lorike, Hitu peninsula, Amboina; March 17, 1923; leg. F. Kopstein. — 1 ovigerous female 44 mm.

Museum Amsterdam

Wukur River, near Sikka, S.E. Flores; fresh water; 1888-1889; leg. M. Weber; cotypes of *Palaemon modestus* De Man. — 3 specimens (1 ovigerous female) 46-60 mm.

Locality unknown. — 2 specimens 46 & 86 mm.

To De Man's (1892) good description of the present species, which is based on the three above specimens from Flores, I only have to add the following remarks:

The rostral formula in my specimens is $\frac{5)\ 9}{2}$.

The scaphocerite (fig. 40a) is about 2.5 times as long as broad, the outer margin is straight. The final tooth is strong and almost reaches the end of the lamella, which is slightly produced antero-internally.

The oral parts are quite normal.

The third pereiopods (fig. 40c) reach with half the propodus beyond the scaphocerite. The

propodus is slightly more than thrice as long as the dactylus and is somewhat more than 1.5 times as long as the carpus. The merus is distinctly longer than the propodus. The fifth leg fails to reach the end of the scaphocerite, the relations between the various joints are like those in the third leg. The last three legs are robust, the posterior being more slender than the anterior. All joints are covered with minute scale-like tubercles.

The pleopods and uropods are normal in shape.

The eggs are rather numerous and measure 0.6 to 0.8 mm in diameter.

The present species, in the shape of the rostrum, the very long first legs and the shape and

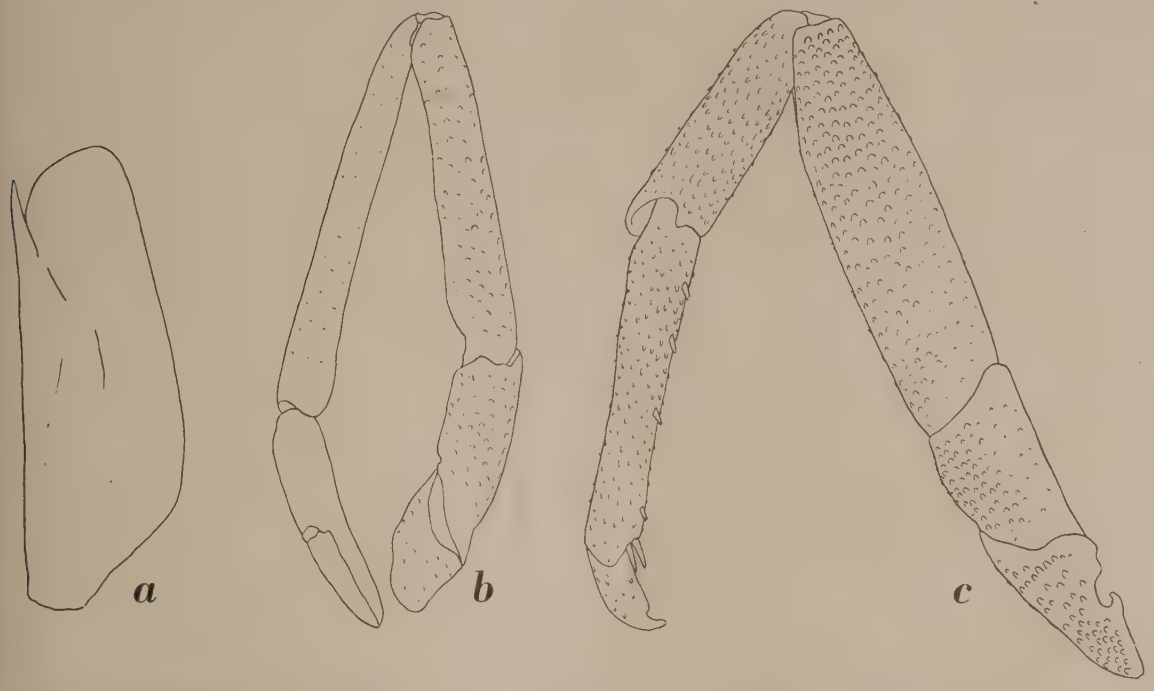

Fig. 40. *Macrobrachium sophronicum* nom. nov. a, scaphocerite; b, first pereiopod; c, third pereiopod. a-c, × 14.

spinulation of the last three legs, resembles most *Macrobrachium placidulum,* but may at once be distinguished from that species by the shape of the second legs, which are symmetrical and have the fingers closing throughout their length, while they are provided moreover with 1 or 2 large teeth on the cutting edges only; furthermore the teeth of the rostrum in the present species extend distinctly beyond the middle of the carapace while in *M. placidulum* they at most reach to the middle of the carapace. The first pereiopods of the present species, though like in *M. placidulum* reaching with the entire carpus beyond the scaphocerite, are not so slender in shape.

De Man (1892) described this species under the name *Palaemon modestus.* Now the name *Palaemon modestus* De Man (1892) is preoccupied by the name *Palaemon modestus* (Heller, 1862), and therefore has to be dropped. A new name is thus needed for the present species; I propose here the name *Macrobrachium sophronicum* nom. nov.

J. Roux (1934a) described a new subspecies of the present species from New Ireland; the differences, which he found between his specimen and those of De Man are:

1. The relation between the length of the carpus and propodus in the second leg of the typical form is 0.6, in Roux's specimen 0.77.

2. The palm of the second leg of the typical form is as long as the carpus, while in the New Ireland specimen it is slightly shorter.

Taking the large variability of the relation between the lengths of the various joints of the second leg in all *Macrobrachium* species in account, these differences are far too small and based on too little material to be considered of even subspecific value. The name *brevimanus* may not be used for the specific or subspecific name of the present species as it is already used by F a b r i c i u s (1798) for the species incerta *Palaemon brevimanus* Fabr.

Palaemon gracilirostris Miers (1875) from Samoa in all probability is very closely related if not identical with the present species, since M i e r s describes the rostrum to be very narrow, with 10 dorsal teeth, which continue beyond the middle of the carapace. M i e r s's description is too short, however, to give any certainty in this question.

The specimens from Flores in the collection of the Zoological Museum at Amsterdam are the cotypes of the present species, the other material is reported upon here for the first time.

Distribution: *Macrobrachium sophronicum* is found in fresh water in the eastern part of the Malay Archipelago, the Riukiu Islands, and New Ireland. The records in literature are: Wukur River, near Sikka, S.E. Flores (D e M a n, 1892), Iriomote, Riukiu Islands (K u b o, 1941), Bimun, New Ireland (J. R o u x, 1934a), ? Upolu, Samoa Islands (M i e r s, 1875). The species is recorded here for the first time from the Moluccas (Batjan and Amboina).

Macrobrachium japonicum (De Haan) (fig. 41)

Palemon japonicus De Haan, 1849, Faun? Japonica, Crust., p. 172.
Palaemon boninensis Stimpson, 1860, Proc. Acad. nat. Sci. Phil.ad., 1860, p. 41.
Palaemon Japonicus De Man, 1879, Notes Leyden Mus., vol. 1, p. 175.
Palaemon boninensis Ortmann, 1891, Zool. Jb. Syst., vol. 5, p. 706.
Palaemon japonicus Ortmann, 1891, Zool. Jb. Syst., vol. 5, p. 726.
Palaemon (*Parapalaemon*) *japonicus* De Man, 1892, Weber's Zool. Ergebn., vol. 2, p. 462, pl. 27 fig. 40.
non *Palaemon japonicus* Rathbun, 1902, Proc. U.S. Nat. Mus., vol. 26, p. 50.
Palaemon (*Parapalaemon*) *japonicus* Parisi, 1919, Atti Soc. Ital. Sci. nat., vol. 58, p. 83, pl. 6 figs. 3, 11.
non *Palaemon japonicus* Maki & Tsuchiya, 1923, Rep. Dept. Agric. Formosa, vol. 3, p. 53, pl. 2 fig. 4.
Macrobrachium japonicus Maki & Tsuchiya, 1923, Rep. Dept. Agric. Formosa, vol. 3, p. 63, pl. 5 fig. 2.
non *Palaemon* (*Leander*) *japonicus* Gee, 1925, Lingnaam agric. Rev., vol. 3, p. 158.
non *Palaemon japonicus* Urita, 1926, Dobuts. Zassh., vol. 33, pp. 214-220.
non *Palaemon* (*Leander*) *japonicus* Kellogg, 1928, Lingnan Sci. Journ. vol. 5, p. 352.
Macrobrachium japonicum Kubo, 1937, Bull. Japan. Soc. sci. Fish., vol. 5, p. 346, figs. 2C, 3C.
Palaemon japonicus Kubo, 1940, Journ. Imp. Fish. Inst. Tokyo, vol. 34, p. 13, textfigs. 6, 7, pl. 2 fig. d.
Palaemon boninensis Kubo, 1940, Journ. Imp. Fish. Inst. Tokyo, vol. 34, p. 15, figs. 8, 9.

Museum Leiden

Japan; cotypes of *Palemon japonicus* De Haan. — 7 specimens 43-84 mm.
Locality unknown. — 6 specimens 67-80 mm (dry).

Description: The rostrum (fig. 41) reaches about to the end of the antennular peduncle, it is straight, only the extreme tip is slightly curved upwards, the upper margin is somewhat convex over

the eyes, it bears 10 to 13 (generally 12) teeth, 4 or 5 of which are placed on the carapace behind the orbit. The distance between the first tooth and the posterior margin of the orbit is $^2/_5$ of the total length of the carapace (rostrum excluded). The lower margin of the rostrum is provided with 2 or 3 rather large teeth. The carapace is entirely smooth, even in adult males. The hepatic spine is almost as strong as the antennal, it is placed distinctly behind and below the latter and is not situated in one line with it.

The abdomen is smooth and normal in shape. The pleurae of the fifth segment are rounded at the top. The sixth segment is slightly more than 1.5 times as long as the fifth segment.

The telson is almost 1.5 times as long as the sixth segment. The two pairs of spines on the dorsal surface are placed in the middle and on $^3/_4$ of the length of the telson. The posterior margin of the telson ends in an acute median point, which in old specimens is truncated. Of the two pairs of posterior spines the inner are longest and distinctly overreach the apex of the telson. Numerous posterior setae are present.

The eyes are well developed and normal in shape.

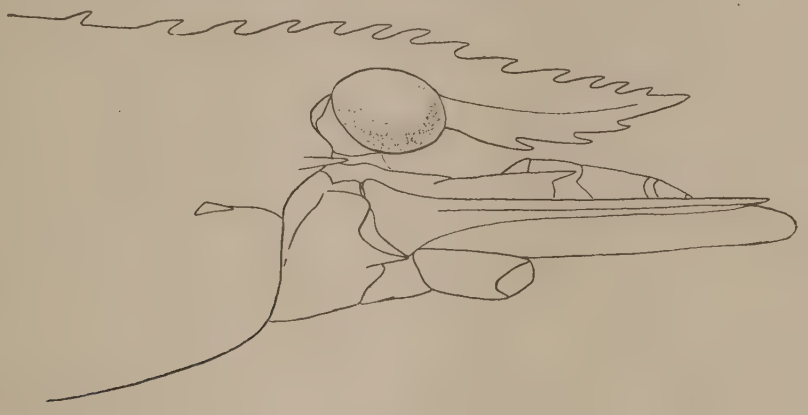

Fig. 41. *Macrobrachium japonicum* (De Haan). Anterior part of body in lateral view. × 5.

The antennulae too are normal.

The scaphocerite is about 2.5 times as long as broad. The outer margin is straight. The final tooth has its tip slightly curved inwards. This tooth is far overreached by the lamella, which has its antero-internal angle distinctly produced.

The oral parts are typical.

The first leg reaches only with a small part of the carpus beyond the scaphocerite. The chela is robust, the fingers are about as long as the palm. The carpus is somewhat less than twice as long as the chela. The merus is slightly shorter, but more robust than the carpus. The ischium is as broad and about half as long as the merus. Both ischium and merus are covered with squamiform spinules, while the other joints are smooth. The second legs are strong, they are equal in shape both in the male and the female. In the adult males they are longer than the entire body. The fingers are slightly less than $^2/_3$ to quite $^1/_2$ as long as the palm, they are rather slender. The dactylus bears two teeth on the cutting edge, the anterior of which is situated in or even before the middle of the finger, two smaller teeth are present between the proximal large tooth and the articulation of the finger with the propodus. The fixed finger too is provided with two large teeth, the distal of which is situated between the two large teeth of the dactylus; like in the dactylus here too two small teeth are present between the

proximal large tooth and the base of the finger. The distal part of the cutting edge of both fingers is entire; there are no tubercles present along the cutting edges as in *M. horstii* and *M. jaroense*, only a few hairs may be observed there. The palm is elongate and slightly compressed, it is of the same breadth throughout its length. Both palm and fingers are entirely covered by broad squamiform anteriorly directed tubercles. The carpus measures $^{2}/_{3}$ of the length of the palm, it is slightly constricted posteriorly and is of about the same breadth as the chela anteriorly. The merus is as long as the carpus, it too narrows posteriorly and is about 1.5 times as long as the ischium. Ischium, merus and carpus are covered with similar spinules as are present on the chela. In younger specimens the legs are much shorter. The fingers are longer in relation to the palm, being $^{2}/_{3}$ as long as the palm in specimens of 63 mm. In these specimens the carpus, which is as long as the merus measures $^{3}/_{4}$ of the length of the palm, while the ischium is almost as long as the merus. The last three legs are relatively stout, the third reaches with part of or with the entire dactylus beyond the scaphocerite. The propodus is 2.5 times to thrice as long as the dactylus. The carpus is somewhat more than half as long as the propodus, which is distinctly shorter than the merus. The ischium is about half as long as the propodus. The fifth leg distinctly fails to reach the end of the scaphocerite; the relations between the lengths of the various joints are about as in the third leg. All joints of the last three legs in the adult male are thickly covered with squamiform spinules.

The pleopods and uropods are normal in shape. Ovigerous females are not present in the material at hand.

The spirit specimens of the collection of the Leiden Museum are the type specimens of De Haan. In all probability the dry specimens too belong to the type lot, though no label was found indicating this; however, of many of those type specimens of De Haan, which are preserved dry, the labels have been lost.

The species mentioned by Rathbun (1902), Maki & Tsuchiya (1923), Urita (1926) and Kellogg (1928) under the name *Palaemon japonicus* do not belong to the present species, but are the *Leander japonicus* Ortmann, which in the present paper (p. 49) is given a new name *Palaemon orientis* nom. nov.

Palaemon boninensis was described by Stimpson (1860) from the Bonin Islands. The species has been redescribed by Kubo (1940) likewise after material from the Bonin Islands. When comparing the descriptions of Stimpson and Kubo and the figures by the latter author with my material and the descriptions and figures available of *Macrobrachium japonicum*, I cannot find any good difference and therefore consider the two forms to be identical. In his key Kubo states *Palaemon boninensis* to differ from *Macrobrachium japonicum* by having the second leg more cylindrical and provided with less hairs; in his description he points to the relatively larger appendix masculina of his male of *P. boninensis*. Now these characters vary strongly with age in the male specimens. As Kubo possessed only a young male of *Palaemon boninensis* (besides an ovigerous female and some juveniles), it becomes clear that what Kubo thinks to be specific differences are nothing but the differences between young and adult specimens of one species. Unless other differences between specimens from the Bonin Islands and Japan come to light, *Palaemon boninensis* must be considered a synonym of *Macrobrachium japonicum*.

Distribution: In literature nothing is mentioned about the habitat which the species inhabits. It is recorded from: Japan (De Haan, 1849; De Man, 1879, 1892), Itiki, Kagoshima Prefecture, Kyushyu (Kubo, 1940), Henoki, Nakizin, Kinmura, Genka-gawa, Kuzi-gawa, Idumi, Yohuke-gawa,

Hentona, and Sasiki-mura, Okinawa, Riukiu Islands (K u b o, 1940), Simozi and Hora-gawa, Miyako, Riukiu Islands (K u b o, 1940), Kagi, W. Formosa (P a r i s i, 1919), Tansui, S.W. Formosa (M a k i & T s u c h i y a, 1923), Bonin Islands (S t i m p s o n, 1860), Byôbu-dani, Ômura, Titi-zima, Bonin Islands (K u b o, 1940).

Macrobrachium horstii (De Man) (fig. 42)

Palaemon (*Parapalaemon*) *Horstii* De Man, 1892, Weber's Zool. Ergebn., vol. 2, p. 460, pl. 27 fig. 39.
Palaemon horstii Schenkel, 1902, Verh. naturf. Ges. Basel, vol. 13, p. 509.
Palaemon (*Parapalaemon*) *horsti* J. Roux, 1930, Rev. Suisse Zool., vol. 37, p. 357.
Palaemon (*Parapalaemon*) *horsti brevidigitus* J. Roux, 1930, Rev. Suisse Zool., vol. 37, p. 358.

Museum Amsterdam

River near Palopo, Luwu District, Celebes; fresh water; 1888-1889; leg. M. Weber; cotypes of *Palaemon Horstii* De Man. — 3 specimens 61-68 mm.

The present species has already extensively been described by D e M a n (1892) and J. R o u x (1930).

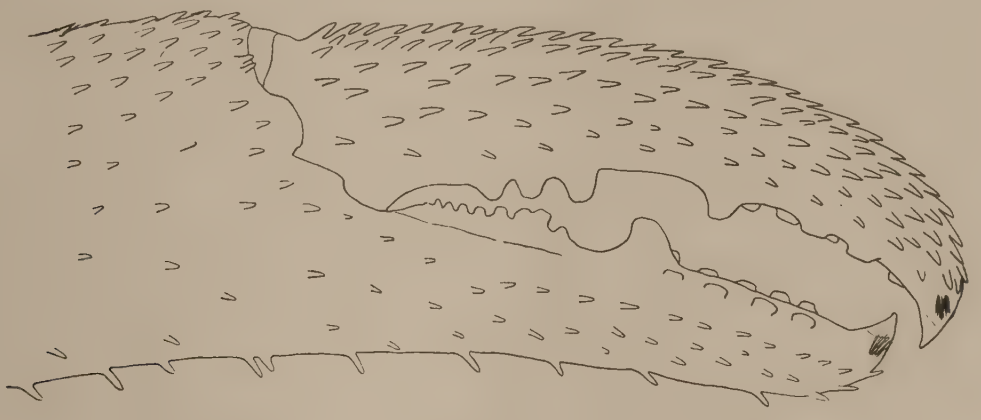

Fig. 42. *Macrobrachium horstii* (De Man). Fingers of second leg of adult male. × 10.

The scaphocerite is about 2.5 times as long as broad. The outer margin is straight or slightly convex. The final tooth has the apex curved slightly inwards, it is far overreached by the lamella, which is produced at the antero-internal angle.

The oral parts are quite normal.

The first leg has the fingers as long as the palm, the merus slightly shorter than the carpus and the ischium about half as long as the merus. D e M a n in his description does not mention the curious armament of the fingers of the second leg of the adult male (fig. 42). Both dactylus and fixed finger bear slightly proximally of the middle of their length a large tooth on the cutting edge, the tooth of the dactylus is placed somewhat before that of the fixed finger. Between the large tooth of the dactylus and the articulation with the propodus 2 to 3 smaller teeth are present, there is a wide gap between the last of these smaller teeth and the large tooth. The fixed finger bears a ridge in the region where in the dactylus the smaller teeth are situated, this ridge consists of 5 to 8 indistinctly separated, often crenulated, teeth. Distally of the large teeth the cutting edge of both fingers shows as a sharp ridge, or is entirely wanting. At each side of the edge up to 8 rounded tubercles are

present; these tubercles are arranged in a row parallel to the edge. In younger specimens and in the females they are missing. These tubercles are entirely different from the spinules, which are placed on the palm and fingers. This dentition and tuberculation has been described by J. R o u x (1930) for his *Palaemon horstii* var. *brevidigitus,* while a similar tuberculation is found in the closely related *Macrobrachium jaroense* (Cowles). The third leg reaches with part of or with the entire dactylus beyond the scaphocerite. The propodus is slightly more than twice to almost thrice as long as the dactylus and is decidedly less than twice as long as the carpus. The merus is distinctly longer than the propodus and twice as long as the ischium. The fifth pereiopod reaches about to the middle of the scaphocerite, the relation between the joints is just like in the third leg.

The pleopods and uropods are normal in shape. No ovigerous females are present in the material examined.

J. R o u x (1930) separates a male specimen from Bali as a variety *brevidigitus* from the main form from Lombok and Celebes on account of the shorter fingers and the shorter carpus. For comparison I give here the measurements of the second legs of the type specimens (all being males), as well as the measurements given by S c h e n k e l (1902) and J. R o u x (1930) for their males.

author	locality	body length (mm)	leg [1]	length of joints of second leg (mm)				
				ischium	merus	carpus	palm	finger
De Man, 1892	Palopo, Celebes	68	r	6.5	13.0	14.5	14.5	10.0
			l?	7.0	13.5	14.0	15.0	10.0
		66	?	—	15.0	18.0	22.0	12.0
			?	—	15.0	18.0	22.0	11.0
		61	?	6.0	8.8	9.0	9.3	6.8
Schenkel, 1902	Enrekang, Celebes	57.5	r	7.8	14.5	16.0	16.3	12.8
		63.5	l	8.0	10.5	11.0	11.0	8.5
J. Roux, 1930	Bali	58.0	r	8.5	16.5	18.0	23.0	12.0
			l	7.5	15.0	16.5	18.0	10.0

1) r = right, l = left

As may be seen from the above data the relation between the lengths of the palm and the fingers varies between 0.50 and 0.73 in the type specimens, in S c h e n k e l's specimens the relation is 0.77 and 0.78. In the type of the var. *brevidigitus* 0.52 and 0.56. The relation between the lengths of carpus and palm in the types of the species is 1 to 1.22, in S c h e n k e l's specimens it is 1 and 1.02, in J. R o u x's specimens (types of the variety) 1.09 and 1.27. There is thus no reason whatever to consider the specimens from Bali to be a separate variety. One generally is not justified in the present genus to base new forms solely on the differences in the relation between the lengths of various limbs, unless these differences are considerable. The measuring of a limb always is rather subjective as none of the limbs has a distinct beginning or end, thus large differences may be found when two different persons measure one and the same limb. The measurements given in literature therefore always must be considered with much reserve.

Distribution: *Macrobrachium horstii* at present only is known from freshwater in the eastern part of the Malay Archipelago. The records in literature are Bali, Lesser Sunda Islands (J. R o u x, 1930), Lombok, Lesser Sunda Islands (J. R o u x, 1930), Palopo, Luwu, Central Celebes (D e M a n, 1892), Enrekang, Central Celebes (S c h e n k e l, 1902).

Macrobrachium jaroense (Cowles)

Palaemon jaroensis Cowles, 1914, Philipp. Journ. Sci., vol. 9 sect. D, p. 385, pl. 3 fig. 8.
Palaemon jaroensis Estampador, 1937, Philipp. Journ. Sci., vol. 62, p. 488.

This species is closely related to *M. horstii* but may be distinguished from it by the shape of the second legs of the adult male.

Distribution: *Macrobrachium jaroense* is only known from the Hibucawan River near Jaro, Leyte, Philippines (Cowles, 1914; Estampador, 1937).

Macrobrachium cavernicola (Kemp)

Palaemon cavernicola Kemp, 1924, Rec. Indian Mus., vol. 26, p. 42, pl. 3 figs. 1-4.
Palaemon cavernicola Kemp & Chopra, 1924, Rec. Indian Mus., vol. 26, pp. 12, 19, 20.
Palaemon cavernicola Spandl, 1926, Tierw. unterird. Gewässer, pp. 89, 140, figs. 59, 104, 106.
Palaemon cavernicola Chappuis, 1927, Tierw. unterird. Gewässer, p. 87, fig. 49.
Palaemon cavernicola Wolf, 1934, Anim. Cavern. Catal., vol. 3, p. 102.

Macrobrachium cavernicola is the only member of the present genus with the cornea of the eyes reduced. It moreover is the only species of *Macrobrachium* which is known to bear a two-jointed mandibular palp. It is a typical cave-animal and is known from fresh water in the Siju Cave, Garo Hills, Assam (Kemp, 1924).

Macrobrachium latimanus (Von Martens) (fig. 43)

Palaemon latimanus Von Martens, 1868, Arch. Naturgesch., vol. 34 pt. 1, p. 44.
Palaemon latimanus De Man, 1888, Arch. Naturgesch., vol. 53 pt. 1, p. 557.
Palaemon latimanus Ortmann, 1891, Zool. Jb. Syst., vol. 5, p. 737, pl. 47 fig. 11.
Palaemon euryrhynchus Ortmann, 1891, Zool. Jb. Syst., vol. 5, p. 738, pl 47 fig. 12.
Palaemon (*Macrobrachium*) *latimanus* De Man, 1892, Weber's Zool. Ergebn., vol. 2, p. 477, pl. 28 fig. 45.
Palaemon (*Macrobrachium*) *latimanus* Nobili, 1900, Ann. Mus. Stor. nat. Genova, vol. 40, p. 485, figs. 3, 4.
Palaemon (*Macrobrachium*) *singalangensis* Nobili, 1900, Ann. Mus. Stor. nat. Genova, vol. 40, p. 487.
Palaemon (*Macrobrachium*) *latimanus* De Man, 1902, Abh. Senckenb. naturf. Ges., vol. 25, p. 780.
Palaemon latimanus Schenkel, 1902, Verh. naturf. Ges. Basel, vol. 13, p. 512.
Palaemon (*Macrobrachium*) *latimanus* De Man, 1904, Trans. Linn. Soc. Lond. Zool., ser. 2 vol. 9, p. 296, pl. 18 figs. 9-12.
non *Palaemon* (*Macrobrachium*) *latimanus* J. Roux, 1917, Nova Guinea, vol. 5, p. 601.
Palaemon (*Macrobrachium*) *latimanus* J. Roux, 1919, Abh. Senckenb. naturf. Ges., vol. 35, p. 340.
Palaemon (*Macrobrachium*) *latimanus* J. Roux, 1923, Capita Zool., vol. 2 pt. 2, p. 15.
Palaemon (*Macrobrachium*) *latimanus* Sendler, 1923, Abh. Senckenb. naturf. Ges., vol. 38, p. 46.
Palaemon (*Macrobrachium*) *latimanus* J. Roux, 1928a, Treubia, vol. 10, pp. 213, 220.
Palaemon (*Macrobrachium*) *latimanus* J. Roux, 1929, S. B. Ges. naturf. Fr. Berlin, 1929, p. 236.
Palaemon (*Macrobrachium*) *latimanus* J. Roux, 1934a, Rev. Suisse Zool., vol. 41, pp. 218, 219.
Palaemon latimanus Adamson, 1935, Occ. Pap. Bishop Mus. Honolulu, vol. 11 pt. 10, p. 17.
Palaemon latimanus Estampador, 1937, Philipp. Journ. Sci., vol. 62, p. 489.
Palaemon latimanus Adamson, 1939, Bull. Bishop Mus. Honolulu, vol. 159, p. 36.
Palaemon latimanus Kubo, 1940, Journ. Imp. Fish. Inst. Tokyo, vol. 34, p. 24, textf. 15, pl. 1 fig. a.

Siboga Expedition

Station 50, Bay of Badjo, westcoast of Flores; dredge and trawl; depth up to 40 m; bottom mud, sand and shells; April 16-18, 1899. — 1 juvenile 12 mm.

Museum Leiden

Anai Canyon, W. Sumatra; altitude 500 m; 1926; leg. E. Jacobson. — 6 specimens 40-110 mm.
Celebes; leg. E. A. Forsten. — 2 specimens 92 and 100 mm (dry).
Amboina; in rapidly running mountain rivulets and waterfalls; October, 1922; leg. F. Kopstein. — 3 specimens 47-58 mm.
River near Atapupu, Timor; 1888-1889; leg. M. Weber. — 1 specimen 42 mm.
Fiji Islands; Museum Godeffroy. — 1 specimen 101 mm.
Locality unknown. — 2 specimens 74 and 77 mm (dry).

Museum Amsterdam

Lolowau, Nias; 1910; leg. J. P. Kleiweg de Zwaan. — 18 specimens (including 6 ovigerous females) 36-74 mm.
River near Bomba, S. Flores; 1888-1889; leg. M. Weber. — 1 specimen 44 mm.
River near Raka-mbaha (= Mbawa), S. Flores; downstreams of a waterfall; 1888-1889; leg. M. Weber. — 2 specimens (1 ovigerous female) 56 and 63 mm.
Wukur River near Sikka, S.E. Flores; fresh water; 1888-1889; leg. M. Weber. — 8 specimens (1 ovigerous female) 16-46 mm.
River near Talae, Roti; 1888-1889; leg. A. Wichmann. — 1 specimen 51 mm.
Bele, East Amanubang District, Central Timor; rivulet of the Noiltuke basin, about 700 m above sealevel. — 1 specimen 105 mm.
Noilbesi River, near path from Noiltoko (via F. Semaan) to Bonleo, Central Timor; about 900 m above sealevel; leg. de Marez Oyens. — 6 specimens 60-105 mm.
Noilaplaal (= Noilbesi) River near Aplaal bivouac, Miomaffo District, Central Timor; 500 m above sealevel; leg. de Marez Oyens. — 3 specimens (1 ovigerous female) 68-100 mm.
River near Atapupu, N. Timor; 1888-1889; leg. A. Wichmann. — 6 specimens (2 ovigerous females) 45-60 mm.
Poso Lake, Celebes; leg. E. E. Abendanon. — 2 specimens 114 and 122 mm.
Northern Halmahera; 250 m above sealevel; leg. W. Kükenthal; coll. J. G. de Man. — 1 specimen 74 mm.
Wakatin, Buru; Station 5 of the Buru Expedition 1921/1922; 544 m above sealevel; February, 1921-March, 1922; leg. L. J. Toxopeus. — 4 specimens 100-125 mm.
Tuba River, W. Ceram; February, 1910; leg. L. F. de Beaufort. — 165 specimens (45 ovigerous females) 28-113 mm (2 specimens bopyrized).
Upper Riuapa River, W. Ceram; February 22, 1910; leg. L. F. de Beaufort. — 33 specimens (15 ovigerous females) 32-92 mm.
Riuapa River, W. Ceram; leg. L. F. de Beaufort. — 1 specimen 26 mm.
Rivulet near Honitetu, W. Ceram; February 22, 1910; leg. L. F. de Beaufort. — 9 specimens (8 ovigerous females) 50-102 mm.
Eme River, W. Ceram; February, 1910; leg. L. F. de Beaufort. — 14 specimens (3 ovigerous females) 31-53 mm.
Tributary of the Upper Eme River near Honitetu, W. Ceram; February 19, 1910; leg. L. F. de Beaufort. — 2 specimens (1 ovigerous female) 47 and 49 mm.

The present species has already been described extensively by De Man (1902) and J. Roux (1923), so that I only will add some additional details.

The carapace is entirely smooth, even in adult males. The hepatic spine lies behind and below the antennal, it is distinctly smaller than the antennal spine.

The abdomen is quite normal in shape. The pleura of the fifth segment has the apex rounded. The sixth segment is only slightly longer than the fifth. The telson is about 1.5 times as long as the sixth abdominal segment. It is of the usual shape.

The eyes and antennules are normal.

The scaphocerite has the outer margin straight or somewhat concave. The final tooth is far overreached by the lamella. It is slightly more than twice as long as broad.

The oral parts are typical.

The last three pereiopods are rather short and plump. The third leg reaches only with the tip of the dactylus beyond the scaphocerite. The propodus is about 2.5 times as long as the dactylus. The carpus is distinctly more than half as long as the propodus. The merus is longer than the propodus. In the fifth pereiopod the merus is relatively shorter, but the other relations are as in the third leg. Ischium, merus, carpus and propodus in the last three legs of the adult males are provided with longitudinal rows of spinules, which are most distinct on the propodus and least distinct on the ischium, where they are confined to the posterior part. In young specimens these spines are missing.

The pleopods and uropods are quite typical.

In younger specimens the rostrum is relatively longer than in the old.

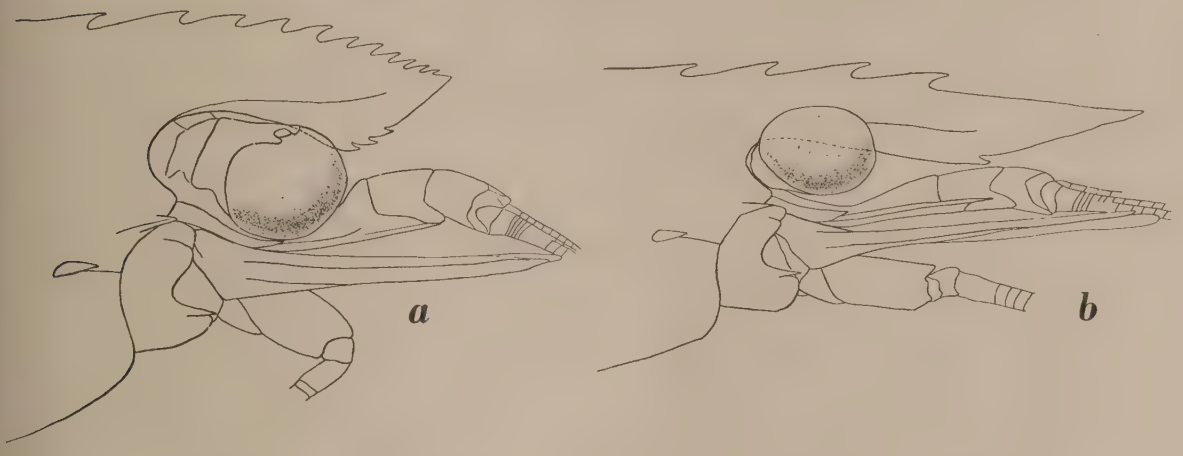

Fig. 43. *Macrobrachium latimanus* (Von Martens). a, anterior part of body (f. *latimanus* s.s.); b, anterior part of body (f. *singalangense*). a, b, × 9.

In the material at hand specimens are present from the Anai Canyon in W. Sumatra. This locality is situated close near Singalang from where Nobili (1899) reported the type specimens of his species *Palaemon singalangensis*. My specimens entirely agree with Nobili's description, the shape of the rostrum being most remarkable. After comparison of this material with the material of the typical *Macrobrachium latimanus*, however, I can not consider this form to be a separate species. Nobili mentioned the following differences between his *P. singalangensis* and *P. latimanus*:

1. The rostrum in *P. singalangensis* is longer than the antennular peduncle.
2. The distal part of the upper margin of the rostrum in *P. singalangensis* has no teeth, while in the proximal part only 4 to 6 teeth are present (figs. 43a, b).
3. The difference between the left and right second leg is larger in *P. singalangensis* than in *P. latimanus*.
4. *P. singalangensis* is more slender and larger.

Point 1, 3, and 4 are of no value at all, in the material of the typical *Macrobrachium latimanus* at my disposal the rostrum sometimes overreaches the antennular peduncle too, the difference in

the shape of the left and right second leg in some adult males of the typical *M. latimanus* often is much more pronounced than that in my adult male of *P. singalangensis,* while I also could not observe any difference in slenderness and size between the two forms. Only thus point 2 remains. In all my material from the Anai Canyon the rostrum bears 3-5 upper teeth (fig. 43b), while the ultimate part of the rostrum is entire, just like in N o b i l i's material. This feature therefore seems to be constant in material from that region. As, however, some of my specimens from other localities show a similar low number of dorsal rostral teeth and sometimes have the extreme distal part entire too (these two shapes of the rostrum may occur in material from one locality), and as I can find no other differences, I can not consider the two forms to be separate species; perhaps the West Sumatran specimens may be considered a local form, though forms with an almost similar rostrum occur among material from Timor, while specimens from Nias, an island off the westcoast of Sumatra, have the rostrum of the typical shape.

The specimen from the Fiji Islands obtained by the Leiden Museum from the Museum Godeffroy probably has belonged to the same lot as the type specimens of *Palaemon euryrhynchus* Ortmann.

The material from Sikka, Flores, includes some very young specimens. Like in *M. australe* and *M. lar,* the specimens show a supraorbital knob (only visible in the smallest specimen), the palp of the mandible is reduced, the hepatic spine is situated close near the anterior margin of the carapace (in a specimen of 35 mm the hepatic spine reaches just with the tip to the anterior margin of the carapace), the dactyli are biunguiculate (in the just mentioned specimen of 35 mm this biunguiculation is still visible). The rostrum in the very young specimens has the dorsal teeth of equal size; here the posterior teeth are not larger and not placed farther apart than the anteriors, as this is the case in the adult specimens. Comparison of these very young specimens from Sikka, which are connected by a gradual series of transitions with the adults, with a single very young specimen from the Siboga Expedition Sta. 50, convinced me that the latter also belongs to the present species. Like in *M. australe* and *M. lar,* the very young specimens may be found in sea, which probably explains the large range of distribution of these species, which all three extend as far eastward as the Marquesas Islands in Polynesia.

The specimens reported by J. R o u x (1917) from the Waitjiri River, N. Dutch New Guinea under the name *Palaemon* (*Macrobrachium*) *latimanus,* certainly does not belong here. In my opinion the specimen, which is present in the collection of the Amsterdam Museum, is a juvenile of *Macrobrachium lar,* as is distinctly shown by the shape of the rostrum, which is much shallower than that of specimens of *M. latimanus* of the same size and which has the teeth larger; furthermore the carpus of the second leg is too long in relation to the merus and the armament of the cutting edge too is different. Comparison of this specimen with material of both *M. latimanus* and *M. lar,* leaves no doubt as to its identity with the latter species.

The specimens collected by W e b e r a n d W i c h m a n n in Flores, Roti and Timor, have been dealt with by D e M a n (1892). Those from Ceram and Buru by J. R o u x, 1923 and 1928a respectively.

Distribution: The species lives in pure fresh water, often at considerable altitudes, but the very young specimens may be found in sea. It ranges from the Malay Archipelago (W. Sumatra) to the Riukiu Islands and eastern Polynesia (Marquesas). The records in literature are: Genka, Hanegi-mura, Okinawa Island, Riukiu Islands (K u b o, 1940), Soreino River, Sipora, Mentawei

Islands, off W. Sumatra (Nobili, 1900), Airmantjur near Singalang, W. Sumatra (Nobili, 1900), Loquilocun, Central Samar, Philippines (Von Martens, 1868), Minahasa, N. Celebes (De Man, 1902), Tomohon, Bone River, and Buol, N. Celebes (Schenkel, 1902), Mapane River, Central Celebes (Schenkel, 1902), N. Halmahera, Moluccas (De Man, 1902), Soakonora, N. Halmahera (De Man, 1902), Wakatin, Buru (J. Roux, 1928a), Tuba, Riuapa and Eme Rivers, W. Ceram (J. Roux, 1923), Honitetu, W. Ceram (J. Roux, 1923), Amboina (De Man, 1888), Ohoinangan, Groot Kai (J. Roux, 1919), Gitgit, Bali (J. Roux, 1929), Kanangar and Mao Marru, Sumba (J. Roux, 1928a), Rana Mese, W. Flores (J. Roux, 1929), Bomba, S. Flores (De Man, 1892), Raka-mbaha (= Mbawa), S. Flores (De Man, 1892), Wukur River near Sikka, S.E. Flores (De Man, 1892), Talae, Roti (De Man, 1892), Atapupu, Timor (De Man, 1892), Dinawa, Owen Stanley Range, Papua (De Man, 1904), Manus, Admiralty Islands (J. Roux, 1934a), Bimoun, New Ireland (J. Roux, 1934a), Tana, New Hebrides (Sendler, 1923), Fiji (Ortmann, 1891), Tahiti (Ortmann, 1891), Marquesas (Adamson, 1939), Hivaoa, Tahuata, Fatuhiva, Uapou and Mohotani Islands, Marquesas Group (Adamson, 1935).

Macrobrachium hendersoni (De Man)

Palaemon (*Parapalaemon?*) *Hendersoni* De Man, 1906, Ann. Mag. nat. Hist., ser. 7 vol. 17, p. 405.
Palaemon (*Parapalaemon?*) *hendersoni* De Man, 1907, Trans. Linn. Soc. Lond. Zool., ser. 2 vol. 9, p. 446, pl. 33 figs. 66-68.
Bithynis (*Parapalaemon*) *hendersoni* Rathbun, 1910, Bull. Mus. comp. Zoöl. Harvard, vol. 52, p. 316, pl. 5 fig. 3.
Palaemon hendersoni Kemp, 1913, Rec. Indian Mus., vol. 8, p. 303, pl. 19 figs. 19-23.
Palaemon hendersoni Kemp, 1918, Rec. Indian Mus., vol. 14, p. 95.
Palaemon hendersoni Kemp, 1924, Rec. Indian Mus., vol. 26, p. 41, pl. 3 fig. 5.
Palaemon hendersoni Kemp & Chopra, 1924, Rec. Indian Mus., vol. 26, pp. 12, 19.
Palaemon hendersoni Spandl, 1926, Tierw. unterird. Gewässer, pp. 89, 140, fig. 105.
Palaemon hendersoni Chappuis, 1927, Tierw. unterird. Gewässer, p. 88.
Palaemon hendersoni Wolf, 1934, Anim. Cavern. Catal., vol. 3, p. 102.
Palaemon yunnanensis Yu, 1936, Bull. Fan Mem. Inst. Zool., vol. 6, p. 308, figs. 3, 4.

Museum Amsterdam

Balassan River, India; leg. M. Weber. — 9 specimens 35-56 mm.
Near Kurseong, Darjeeling, N. India; December, 1898; leg. M. Weber. — 7 specimens 29-55 mm.

The present species has been extensively described by De Man (1907) and Kemp (1913), these authors also gave good figures. I will therefore give only some additional details.

In my specimens the number of dorsal teeth of the rostrum varies between 7 and 9 (in 4 specimens being 7, in 7 specimens 8 and in 4 specimens 9). This formula thus is just intermediate between those of Kemp's and De Man's specimens from Assam and Darjeeling (formula $\frac{5-7}{2}$), and those specimens mentioned by Kemp from the Inlé Lake (Burma) (formula $\frac{9-11}{3}$). Rathbun's (1910) specimens had the formula $\frac{7}{2-3}\frac{10}{}$. In all other respects my specimens resemble those described and figured by Kemp (1913).

The oral parts as well as the pleopods and uropods are typical in shape.

Ovigerous females are not present in my material and as far as I know they have not yet been recorded in literature.

Yu (1936) described a new *Palaemon* from Yunnan Province, S. China, which he named *Palaemon yunnanensis*. His description and good figure show that this species is identical with *Macrobrachium hendersoni*. The Yunnan specimens have the rostrum very short and provided with 7-9 dorsal and 2 ventral teeth. The fingers of the large chela of the male bear the typical longitudinal hairy grooves.

Distribution: The species is an exclusive freshwater form and lives at high altitudes far inland (300-1300 m), it is found up till now only in the eastern Himalayas from Darjeeling to Yunnan and N. Burma. The records in literature are: Kurseong, Darjeeling District (Kemp, 1913), Darjeeling (De Man, 1906, 1907; Kemp, 1918), Siyu Cave, Garo Hills, Assam (Kemp, 1924), Garo Hills (Kemp, 1918, 1924), Sirpo and Egar Streams near Renging and Rotung, Abor, N. Assam (Kemp, 1913), Gokteik Gorge, S. Shan States, Burma (Rathbun, 1910), He-Ho Stream, Yawngwhe State, Burma (Kemp, 1918), Swa Reserve Forest, Burma (Kemp, 1918), Mann-Tchi-Pan, Yunnan (Yu, 1936).

Macrobrachium clymene (De Man)

Palaemon (*Macrobrachium*) *clymene* De Man, 1902, Abh. Senckenb. naturf. Ges., vol. 25, p. 794, pl. 25 fig. 50.

Museum Leiden

Baram River, Sarawak; 1893-1894; leg. W. Kükenthal; cotypes of *Palaemon clymene* De Man. — 4 specimens (1 ovigerous female) 33-53 mm.

The present specimen formed part of De Man's type material and has been extensively described and figured by him. I only will add the following remarks.

The fifth abdominal segment has the apex rounded.

The scaphocerite reaches slightly beyond the antennular peduncle and is a little more than twice as long as broad. The outer margin is somewhat convex and ends in a strong final tooth, which is somewhat overreached by the lamella, which has the antero-internal angle slightly produced.

The oral parts and the pleopods are normal.

Distribution: The species only is known from Kükenthal's specimens from the Baram River, Sarawak.

Macrobrachium patsa (Coutière)

Palaemon (*Parapalaemon*) *Patsa* Coutière, 1899, Bull. Mus. Hist. nat. Paris, vol. 5, p. 382.
Palaemon (*Parapalaemon*) *Patsa* Coutière, 1900, C. R. Acad. Sci. Paris, vol. 130, p. 1266.
Palaemon (*Parapalaemon*) *Patsa* Coutière, 1901, Ann. Sci. nat. Zool., ser. 8 vol. 12, p. 284, pl. 11 figs. 20-22.
Macrobrachium patsa Rathbun, 1935, Bull. Mus. comp. Zoöl. Harvard, vol. 79, p. 27.

Distribution: The species is recorded from E. Africa and Madagascar. The records are: Tsavo, Kenya, E. Africa (Rathbun, 1935), Onilahy River, S.W. Madagascar (Coutière, 1899, 1900, 1901), Antongil Bay, N.E. Madagascar (Coutière, 1899, 1900, 1901), Mare near Andampy, Manahara River, E. Madagascar (Coutière, 1899, 1900, 1901).

Macrobrachium yui nom. nov.

Palaemon brevicarpus var. *heterochirus* Yu, 1936, Bull. Fan Mem. Inst. Zool., vol. 6, p. 305, figs. 1, 2.

In 1936 Y u described a new species of *Macrobrachium* from Yunnan. He thought his specimens to belong to *Palaemon brevicarpus* De Haan, though being varietally distinct from D e H a a n's species, and therefore named them *Palaemon brevicarpus* De Haan var. *heterochirus*. Now *Palaemon brevicarpus* De Haan is identical with *Macrobrachium carcinus* (L.) (= *Palaemon jamaicensis* auctt.) and is totally different from Y u's Yunnan specimens. I can not identify Y u's form with any of the described species of *Macrobrachium* and in my opinion it certainly belongs to a new species. The name *heterochirus* may not be used for the species as it has already been used before for a spedies of this genus (*Palaemon heterochirus* Wiegmann, 1836). Therefore I propose the new name *Macrobrachium yui* nom. nov. for it, in honour of the Chinese author, who has done so much to enlarge our knowledge of the Chinese Caridea.

Distribution. The type specimens of this species have been collected in a mountain stream at Ning-Erh, Yunnan, S. China.

Macrobrachium trompii (De Man)

?*Palaemon Javanicus* Von Martens, 1868, Arch. Naturgesch., vol. 34 pt. 1, p. 45.
Palaemon (*Parapalaemon*) *Trompii* De Man, 1898a, Notes Leyden Mus., vol. 20, p. 144, pl. 7.
Palaemon (*Parapalaemon*) *thienemanni* J. Roux, 1932, Arch. Hydrobiol., suppl. vol. 11, p. 570, figs. a, b.
Palaemon (*Parapalaemon*) *trompi armatus* J. Roux, 1936, Bull. Raffles Mus., vol. 12, p. 30.

Museum Leiden

Mandai River near Nangaraun, Kapuas Basin, Central Borneo; 1894; Dutch Borneo Expedition; cotypes of *Palaemon Trompii* De Man. — 2 ovigerous females 47 and 50 mm.
Ketungau River, Kapuas Basin, Central Borneo; 1894; leg. M. Moret; cotypes of *Palaemon Trompii* De Man. — 2 specimens (1 ovigerous female) 46 and 66 mm.
Sintang, Kapuas River, Central Borneo; 1894; Dutch Borneo Expedition; cotypes of *Palaemon Trompii* De Man. — 2 specimens 28 and 30 mm.

Museum Amsterdam

Taluk, Central Sumatra; leg. J. P. Kleiweg de Zwaan. — 5 specimens 41-72 mm.
Muaraklingi, Upper Musi River, S. Sumatra; May 10, 1929; leg. A. Thienemann; Deutsche Limnologische Sunda-Expedition; cotypes of *Palaemon thienemanni* Roux. — 10 specimens 22-39 mm.
Mandai River near Nangaraun, Kapuas Basin, Central Borneo; 1894; Dutch Borneo Expedition; cotype of *Palaemon Trompii* De Man. — 1 ovigerous female 46 mm.

The ovigerous female from Ketungau and those from Nangaraun have the chelae of the second legs provided with closely packed short velvety setae in the distal part of the palm and the whole surface of the fingers, while small spinules may be seen in the proximal part of the palm. D e M a n's statement that in this species there are no spinules on the second legs and that only scattered hairs are present, thus is erroneous. The males in the collections at hand certainly have not yet attained their final size and it may be expected therefore that in the full grown males such a spinulation and pubescence also will be found. This is the more probable as the specimens described

by R o u x from the Malay Peninsula as *Palaemon trompi armatus* have the second leg spinulate and its chelae pubescent in the males as well as in the females. R o u x (1936) separated his specimens as a distinct variety on account of this spinulation and pubescence from the Bornean main species. As, however, as pointed out above, in the Bornean specimens these velvety hairs and spinules are present, there is no reason whatever to treat the Malay specimens as a separate variety, the more as no other differences exist.

J. R o u x (1932) described a new species *Palaemon thienemanni* from S. Sumatra. The type material of this species, part of which is present in the Amsterdam Museum, entirely consists of juvenile specimens, the largest of which is 40 mm long. J. R o u x himself already pointed to the close resemblance of his species to *P. trompii,* but he thought it different in the shape of the second legs; in *P. thienemanni* namely the carpus should be shorter than the merus, while in *P. trompi* the merus should be slightly shorter than the carpus (R o u x, 1937, p. 571, of course makes an error when he states: "bei *Pal. trompi,* im Gegenteil ist der Merus ein wenig länger.") Among the 10 specimens of the type lot of *P. thienemanni* at my disposal only one second leg is present. In this leg, however, the carpus in reality is slightly longer than the merus, just like in *M. trompi,* the measurements of the leg being: ischium 2.6 mm, merus 2.9 mm, carpus 3.2 mm, palm 2.5 mm, fingers 2.3 mm. We thus must come to the conclusion, that either R o u x's measurements are wrong, or that the relation between the lengths of the carpus and merus is variable in the species. The differences between these lengths are extremely small indeed in young specimens as may be seen from the following table:

author	material	length merus (mm)	length carpus (mm)
De Man, 1898a	♂ of 30 mm	3.5	4.0
	♀ of 47 mm	5.5	6.3
J. Roux, 1932		5.0	4.5
		6.0	5.5
		4.8	4.5
		5.0	4.5

The identity of J. R o u x's species with *Macrobrachium trompii* therefore becomes very probable. As the material from Taluk, Central Sumatra (Mus. Amsterdam), which undoubtedly belongs to *M. trompii,* shows that the latter species indeed occurs in Sumatra, we safely may accept the identity of *P. thienemanni* with *M. trompii.*

My specimens from Taluk, Sumatra entirely agree with the typical specimens. The largest specimen, a male of 72 mm has the chelae more robust than those of a male of 69 mm, which closely resembles the largest specimen of the type collection (a male of 66 mm from Ketungau). The Sumatran specimen of 72 mm probably is not yet full grown as no pubescence is observed on the chelae of the second legs, though spinules are distributed over all the joints of these legs. The palm, which is as long as or slightly longer than the fingers, is somewhat swollen. In the proximal third of their cutting edge the fingers bear 4 or 5 small equally sized teeth. The carpus is conical and only slightly longer than the merus. There are long hairs scattered over all joints of the second legs, just as in the typical male specimens. No females are present in the Taluk material.

V o n M a r t e n s (1868) described a specimen from Danau Sriang, in the basin of the

Kapuas River, Central Borneo, under the name *Palaemon Javanicus* Heller. As already pointed out under the latter species (p. 193), it is more probable, concluding from V o n M a r t e n s's description that his specimens belong to *M. trompii* than to *M. javanicum*.

Distribution. The present species is recorded in literature from fresh water in the Malay Peninsula, Sumatra and Borneo. The records are: Gunong Pulai, Johore, Malay Peninsula (J. R o u x, 1936), Muaraklingi, Musi River, S. Sumatra (J. R o u x, 1932), Danau Sriang, Kapuas Basin, Central Borneo ? (V o n M a r t e n s, 1868), Mandai and Ketungau Rivers and Sintang, Kapuas Basin, Central Borneo (D e M a n, 1898a).

Macrobrachium lorentzi (J. Roux) (fig. 44)

Palaemon (*Parapalaemon*) *lorentzi* p.p. J. Roux, 1921, Nova Guinea, vol. 13, p. 596, pl. 16 figs. 1-3.

Museum Amsterdam

Went Mountains, near the source of the Van der Sande River, S. W. New Guinea; October 11, 1909; leg. H. A. Lorentz; New Guinea Expedition, 1909; cotypes of *Palaemon lorentzi* J. Roux. — 1 specimen 30 mm.

Kloof bivouac, Upper Lorentz River, S. W. New Guinea; November 27 and December 2 and 3, 1912; leg. G. Versteeg; New Guinea Expedition, 1912; cotypes of *Palaemon lorentzi* J. Roux. — 4 specimens 67-78 mm.

Alkmaar Camp, Upper Lorentz River; from Exploration detachment; New Guinea Expedition, 1909; cotypes of *Palaemon lorentzi* J. Roux. — 2 specimens 72 and 86 mm.

Sabang, on tributary of the Lorentz River; July 17, 1907; leg. H. A. Lorentz; New Guinea Expedition, 1907; cotype of *Palaemon lorentzi* J. Roux. — 1 specimen 76 mm.

The following details may be added to J. R o u x's description, which is made after the above material.

Of the upper rostral teeth 4 or 3 are placed behind the orbit. The distance between the first dorsal tooth and the posterior margin of the orbit is about 1/4 of the length of the carapace (rostrum excluded). There always is a rather large interval between the apex of the rostrum and the distal lower tooth. The anterolateral part of the carapace in the adult male is scabrous. The hepatic spine is placed behind and below the antennal and does not lie in one line with it.

The abdomen and telson are smooth. The pleura of the fifth segment ends in a small blunt tooth. The sixth segment is only a little longer than the fifth. The telson is of the common shape, the anterior dorsal pair of spinules lies slightly behind the middle of the telson, the other pair midway between the anterior pair and the posterior margin of the telson. This posterior margin ends in a sharp triangular point, which is distinctly overreached by the inner pair of posterior spinules.

The eyes and antennules are normal in shape.

The scaphocerite is somewhat less than 2.5 times as long as broad. It is not much narrower anteriorly than posteriorly. The outer margin mostly is straight or slightly concave. The lamella has the antero-internal angle slightly produced. The final tooth fails to reach the end of the lamella.

The oral parts are normal in shape.

The first legs have the carpus distinctly less than twice as long as the chela. In R o u x's figure of the second leg, the relation between the lengths of the various joints is not correct, therefore a new figure (fig. 44) of this leg is given here. The last three pairs of pereiopods are rather robust.

The third reaches to or slightly beyond the scaphocerite. The dactylus bears a row of hairs along the anterior margin. The propodus is about 2.5 times as long as the dactylus. The carpus is more than half as long as the propodus. The merus is slightly shorter than the propodus and carpus combined. The fifth pereiopod fails to reach the end of the scaphocerite, it is somewhat more slender than the third leg. The propodus is about thrice as long as the dactylus, twice as long as the carpus and as long as the merus. The posterior margin of the propodus in all three legs bears the usual spinules, while in the fifth leg the transverse rows of setae are present in the distal part.

The pleopods and uropods are quite normal in shape.

The present species shows most resemblance to *M. pilimanus,* but may at once be distinguished from that species by the pubescence of the chelae and by the longer and more slender carpus of the second legs.

Fig. 44. *Macrobrachium lorentzi* (J. Roux). Second leg of adult male. × 3.5.

The collection examined also contained a specimen from Alkmaar, Upper Lorentz River (November, 1909; leg. H. A. Lorentz), which is the specimen indicated by Roux in his description as juv. This specimen is damaged: the anterior part of the rostrum is broken and it lacks both second legs. Its length (measured from the tip of the telson to the tip of the scaphocerites) is 57 mm. In the jar containing this specimen a label was found bearing the following inscription in J. Roux's handwriting "Pal. (Parap.) ? lorentzi Roux, beschädigt". This specimen certainly is no *Macrobrachium lorentzi* as is shown by its very slender legs, by the shape of the scaphocerites and that of the remaining part of the rostrum. Comparison of this specimen with material of *M. mammillodactylus* convinced me that it must belong to the latter species.

Distribution. The species lives in freshwater far inland. It only is known from the above localities in the Lorentz River basin, S.W. New Guinea.

Macrobrachium pilimanus (De Man)

Palaemon pilimanus De Man, 1879, Notes Leyden Mus., vol. 1, p. 181.
?*Palaemon* Miers, 1880, Ann. Mag. nat. Hist., ser. 5 vol. 5, p. 384.

Palaemon pilimanus De Man, 1887, Midden Sumatra Exped., vol. 4 pt. 1 n. 4, p. 4, pl. 2 fig. 2.
Palaemon pilimanus Ortmann, 1891, Zool. Jb. Syst., vol. 5, p. 735, pl. 47 fig. 9.
Palaemon (*Macrobrachium*) *pilimanus* De Man, 1892, Weber's Zool. Ergebn., vol. 2, p. 471, pls. 27, 28 figs. 44 a-h.
Palaemon (*Macrobrachium*) *pilimanus leptodactylus* De Man, 1892, Weber's Zool. Ergebn., vol. 2, p. 476, pl. 28 figs. 44 i-l.
Palaemon (*Macrobrachium*) *pilimanus* De Man, 1898a, Notes Leyden Mus., vol. 20, p. 158.
Palaemon (*Macrobrachium*) *pilimanus* Borradaile, 1900, Proc. zool. Soc. Lond., 1900, p. 93.
Palaemon (*Macrobrachium*) *pilimanus* Hanitsch, 1900, Journ. Roy. Asiat. Soc. Straits Br., vol. 34, p. 85.
Palaemon (*Macrobrachium*) *pilimanus* Nobili, 1900, Ann. Mus. Stor. nat. Genova, vol. 40, p. 485.
Palaemon pilimanus Lanchester, 1901, Proc. zool. Soc. Lond., 1901 pt. 2, p. 567.
Palaemon (*Macrobrachium*) *pilimanus* Nobili, 1901c, Boll. Mus. Zool. Anat. comp. Torino, vol. 16 n. 397, p. 2.
Bithynis (*Macrobrachium*) *pilimanus* Rathbun, 1910, Bull. Mus. comp. Zoöl. Harvard, vol. 52, p. 317.
Palaemon pilimanus Koningsberger, 1913, Java zoöl. biol., p. 401.
Palaemon pilimanus Kemp, 1918a, Mem. Asiat. Soc. Bengal, vol. 6, p. 267.
Palaemon (*Macrobrachium*) *pilimanus* Calman, 1925, Journ. fed. Malay States Mus., vol. 8 pt 3, p. 167.
Palaemon (*Macrobrachium*) *pygmaeus* J. Roux, 1928a, Treubia, vol. 10, p. 222, figs. 1-4.
Palaemon (*Macrobrachium*) *pilimanus* J. Roux, 1932, Arch. Hydrobiol., suppl. vol. 11, pp. 566, 572.
Palaemon (*Macrobrachium*) *pilimanus malayanus* J. Roux, 1935, Bull. Raffles Mus., vol. 9, p. 32.
Macrobrachium pilimanus Suvatti, 1937, Check List aq. Fauna Siam, p. 49.
Macrobrachium pilimanus Chace, 1938, Proc. New England zool. Cl., vol. 17, p. 20.

Museum Leiden

Manindjau Lake, W. Sumatra; 1888-1889; leg. M. Weber. — 6 specimens (1 ovigerous female) 35-40 mm.

Singkarak Lake, W. Sumatra; 1888-1889; leg. M. Weber. — 7 specimens (1 ovigerous female) 34-41 mm.

Bua Cave, near Sidjungdjung, W. Sumatra; in tepid water of the cave; March, 1914; leg. E. Jacobson. — 1 specimen 23 mm. (rather poor condition).

Andola, Padangsche Bovenlanden (Padang Highlands), W. Sumatra; May, 1914; leg. E. Jacobson. — 1 specimen 50 mm.

Alahanpandjang, West Sumatra; in river; 1877; leg. J. F. Snelleman; Central Sumatra Expedition; cotypes of *Palaemon pilimanus* De Man. — 58 specimens (24 ovigerous females) 23-46 mm.

Silago, Central Sumatra; 1877; leg. J. F. Snelleman; Central Sumatra Expedition. — 1 specimen 44 mm.

Muaralabuh, W. Sumatra; 1877; leg. J. F. Snelleman; Central Sumatra Expedition; cotypes of *Palaemon pilimanus* De Man. — 5 specimens 36-47 mm.

Buitenzorg, W. Java; February, 1927; leg. P. Buitendijk. — 2 specimens 27 and 29 mm.

Buitenzorg, W. Java; 1888-1889; leg. M. Weber. — 2 specimens 43 and 45 mm.

Buitenzorg; 1888-1889; leg. M. Weber; cotypes of *Palaemon pilimanus leptodactylus* De Man. — 2 specimens 51 and 53 mm.

Buitenzorg; May, 1909; leg. H. H. van der Weele. — 45 specimens (14 ovigerous females) 22-49 mm.

Tjibodas, Gede mountain, W. Java; July, 1909; leg. H. H. van der Weele. — 5 specimens 11-30 mm.

Tjibodas; December 15, 1920; leg. H. Boschma. — 1 specimen 33 mm.

Sukabumi, W. Java; 1908-1909; leg. W. Oppenoorth. — 8 specimens (2 ovigerous females) 33-57 mm.

Panumbangan, W. Java; in stalactitic caves; November, 1915; leg. S. Leefmans. — 1 ovigerous female 36 mm.

Tjibabalukan River, near desa Marokko, S. coast of W. Java; May 25 and 26, 1939; leg. C. P. J. de Haas. — 11 specimens 17-26 mm.

Tretes near Malang, E. Java; in rivulet on slope of Ardjuno Mountain; altitude 900 m; June, 1924, March and May, 1925; leg. P. Buitendijk. — 63 specimens (1 ovigerous female) 20-47 mm.

Malang, E. Java; freshwater lake; March 10, 1918 and August, 1922; leg. P. Buitendijk. — 18 specimens 15-31 mm.

Sanggau, Kapuas River, S. W. Borneo; 1893-1894; Dutch Borneo Expedition. — 5 specimens (1 ovigerous female) 24-29 mm.

Sintang, Kapuas River, S. W. Borneo; 1894; Dutch Borneo Expedition. — 4 specimens (1 ovigerous female) 32-49 mm.

Ketungau River, tributary of the Kapuas, S. W. Borneo; August 15, 1894; Dutch Borneo Expedition. — 3 specimens (1 ovigerous female) 29-36 mm.

Near the source of the Kajan River, tributary of the Kapuas, S. W. Borneo; 1900; leg. A. W. Nieuwenhuis. — 22 specimens (2 ovigerous females) 30-53 mm.

Upper Sibau River, tributary of the Kapuas River, S. W. Borneo; 1893-1894; Dutch Borneo Expedition. — 1 specimen 57 mm.

Museum Amsterdam

Medan, eastcoast of Sumatra; September 10, 1920; leg. J. B. Corporaal. — 2 specimens (1 ovigerous female) 31 and 37 mm (1 specimen bopyrized).

Bataklanden, N. Sumatra; coll. J. G. de Man. — 2 specimens 34 and 37 mm.

Rivulet near Petok, W. Sumatra; June 28, 1929; leg. L. F. de Beaufort. — 10 specimens (1 ovigerous female) 21-37 mm.

Manindjau Lake W. Sumatra; 1888-1889; leg. M. Weber. — 71 specimens (2 ovigerous females) 14-48 mm.

River near Manindjau, where it enters the lake; 1888-1889; leg. M. Weber. — 31 specimens (1 ovigerous female) 16-44 mm.

Fort de Kock, W. Sumatra; altitude 920 m; from well, between Potamogeton; 1926; leg. E. Jacobson. 3 specimens 27-44 mm.

Kotabaru near Padangpandjang, W. Sumatra; altitude 1200 m; in marsh; February, 1925; leg. E. Jacobson. — 20 specimens (2 ovigerous females) 18-47 mm.

Anai Canyon, W. Sumatra; altitude 500 m; 1926; leg. E. Jacobson. — 14 specimens 15-48 mm.

Airteganang, between Fort de Kock and Padangpandjang, W. Sumatra; 1888-1889; leg. M. Weber. — 1 specimen 31 mm.

Canyon near Airmantjur, S. of Padangpandjang, W. Sumatra; 1888-1889; leg. M. Weber. — 2 specimens 48 and 49 mm.

Kajutanam, S. of Padangpandjang, W. Sumatra; 1888-1889; leg. M. Weber. — 7 specimens (1 ovigerous female) 19-42 mm.

Singkarak Lake, W. Sumatra; 1888-1889; leg. M. Weber. — numerous specimens (including ovigerous females) 13-42 mm.

Sidjungdjung, W. Sumatra; leg. J. P. Kleiweg de Zwaan. — 1 specimen 39 mm.

Solok, S. of Singkarak Lake, W. Sumatra; leg. J. P. Kleiweg de Zwaan. — 10 specimens 22-31 mm.

Danau-di-baruh, lake S. of Singkarak Lake; 1888-1889; leg. M. Weber. — 5 specimens 30-44 mm.

Danau-di-atas, lake S. of Danau-di-baruh; 1888-1889; leg. M. Weber. — 35 specimens (1 ovigerous female) 20-38 mm.

Tambangsawah near Benkulen, S. W. Sumatra; 1925; leg. N. Seckerling. — 1 specimen 42 mm.

Taluk, Central Sumatra; leg. J. P. Kleiweg de Zwaan. — 2 specimens (1 ovigerous female) 37 and 51 mm.

Buitenzorg, W. Java; 1888-1889; leg. M. Weber. — 16 specimens (2 ovigerous females) 21-58 mm.

Buitenzorg; 1888-1889; leg. M. Weber; cotypes of *Palaemon pilimanus leptodactylus*. — 9 specimens (1 ovigerous female) 14-55 mm.

Tjibodas, Gede Mountain, W. Java; 1888-1889; leg. M. Weber. — 12 specimens (1 ovigerous female) 24-55 mm.

Tjinjiruan Quinine Gardens, Puntjak-Gede District, W. Java; altitude about 1600 m; leg. Kerkhoven. — 121 specimens 19-42 mm.

Sinagar near Sukabumi, W. Java; 1888-1889; leg. M. Weber. — 4 specimens.

Pasirdatar near Tjisaät, vicinity of Sukabumi, W. Java; December, 1907; altitude 2700 m. — 11 specimens 37-53 mm.

Mountain rivulet of the Patuha Mountain, S. W. Java; cold water; May 26, 1929; leg. L. F. de Beaufort. — 23 specimens 12-49 mm.

Rivulet along the slope of the Patuha Mountain, S. W. Java; altitude 2000 m; April 20, 1930; leg. W. S. S. van Benthem Jutting. — 1 specimen 44 mm.

Situ Bagendit Lake, W. Java; 1888-1889; leg. M. Weber. — 5 specimens 46-54 mm.

Ungaran Mountain, Central Java; December, 1909; leg. E. Jacobson. — 14 specimens (1 ovigerous female) 18-47 mm.

Near Salatiga, Central Java; April 9, 1910; leg. L. F. de Beaufort. — 1 specimen 35 mm.

Rivulet in Guwa Gremeng Cave, Sewu Mountains, near the southcoast of Central Java; February, 1911; leg. E. Jacobson. — 7 specimens 28-49 mm.

Sekartjo River near Lawang, E. Java; November, 1909; leg. L. F. de Beaufort. — 2 specimens (1 ovigerous female) 41 and 59 mm.

Pond near Mendit, near Malang, E. Java; December, 1907. — 20 specimens 18-39 mm.

Small lake near Blimbing, near Malang, E. Java; November 26, 1909; leg. L. F. de Beaufort. — 47 specimens 13-32 mm.

Djember, E. Java; May 10, 1909; leg. H. A. Lorentz. — 2 specimens 41 and 47 mm.

Kastoba crater lake, Bawean Island, Java Sea; 250 m altitude; November 25-27, 1937; leg. J. H. Coert. — 47 specimens 11-28 mm.

Indonesia. — 1 specimen 28 mm.

Locality unknown. — 5 specimens 44-53 mm.

Description. The rostrum is straight, with the upper margin somewhat convex; it is, when compared with the rostra of *M. hirtimanus, M. placidulum* etc., rather high. It reaches somewhat beyond the base of the last segment of the antennular peduncle, sometimes reaching to the end of this peduncle. The upper margin bears 9 to 15, generally 10 or 11 teeth, which are of about equal size and are regularly arranged over the upper margin of the rostrum. 4 or 5 teeth of the rostrum (seldom 3) are placed behind the posterior limit of the orbit. The lower margin of the rostrum bears 1-3, generally 2 teeth. The carapace is smooth, in very old males, however, minute prickles are present in the anterolateral part. The hepatic spine is somewhat smaller than the antennal and is placed on a much lower level.

The abdomen is smooth. The pleurae of the fifth segment have the top rounded. The sixth segment is somewhat less than 1.5 times as long as the fifth.

The telson has the usual shape. It dorsally bears 2 distinct pairs of spines, one in the middle and one at $^3/_4$ of the length of the telson. The posterior margin of the telson is rounded and ends in a sharp small median point. The inner pair of posterior spines distinctly overreaches the apex of the telson.

The eyes are well developed. The antennulae are of the usual shape.

The scaphocerite is twice to 2.5 times as long as broad. The outer margin is straight, the final tooth is strong, with the tip curved slightly inwards (seldom the tip is straight or directed slightly outwards). The lamella somewhat overreaches the final tooth and its anterior margin is rounded.

The oral parts are normal in shape.

The first pereiopods reach with $^1/_4$ to $^1/_2$ of their carpus (in very old specimens with almost

the entire carpus) beyond the scaphocerite. The fingers are about as long as the palm. The carpus is 1.5 times, or slightly more, as long as the chela and is $^{3}/_{4}$ to $^{1}/_{3}$ of the length of the merus. The ischium is about $^{2}/_{3}$ of the length of the merus. The second pereiopods in the adult male generally are unequal in size, though they are equal in shape. The larger leg reaches with almost the entire carpus beyond the scaphocerite (in very old males even with part of the merus). The fingers are $^{3}/_{4}$ to $^{4}/_{4}$ of the length of the palm. They close throughout their length. The cutting edges are provided with numerous (about 10) small teeth of equal size, which are regularly distributed over the whole length of the cutting edges. In younger specimens these teeth are not present in the ultimate part of the cutting edges. The palm is more or less compressed, it is about twice as long as high. No spines are present on the chela, though sometimes minute spinules may be observed there. Numerous tufts of long soft hairs are present on the entire surface of the fingers, such long and soft hairs also are present on the outer surface of the palm; in the distal part of the palm, near the bases of the fingers these hairs are about as long as those of the fingers, but proximally the hairs of the palm become shorter and even are absent in the extreme proximal portion. The inner surface of the palm generally is naked, only in very old males it is pubescent too. The carpus is short triangular, generally it is somewhat less than half as long as the palm, sometimes it is up to $^{4}/_{5}$ of the length of the palm. It rapidly narrows posteriorly and bears on its upper surface numerous very small and sharp spinules, and some scattered rather stiff setae. The merus is 1.5 times to twice as long as the carpus, it is distinctly thickened in the middle. The ischium is as long as the carpus. Like the carpus, the ischium and merus are provided with minute spinules and scattered stiff hairs. The smaller leg reaches with the chela and a small part of the carpus (in large males with the entire carpus) beyond the scaphocerite. The fingers are slightly longer, to 1.5 times as long as the palm, their cutting edge bears in the proximal third of its length 5 to 9 small teeth of equal size, tufts of setae again are present on the entire surface of the fingers. The pubescence of the fixed finger continues a small distance on the palm, but the larger part of the palm is naked, bearing only some scattered rather stiff hairs (in very old specimens a larger part of the palm, up to more than $^{1}/_{2}$ of its inner and outer surface is pubescent). The carpus is about $^{1}/_{2}$ to $^{2}/_{3}$ as long as the palm; the general shape of the carpus, merus and ischium is like in the larger leg. In very young specimens the second legs already differ in size, they are more slender than those of the old males, no spinules are present, but the pubescence soon is visible. The third leg reaches with part of or with the entire dactylus beyond the scaphocerite, while the fifth leg fails to reach the end of that scale. The dactylus is simple or with a faint indication of a lobiform process behind the apex. The propodus is 2.5 times as long as the dactylus. The carpus is half as long as the merus and slightly more than half as long as the propodus. The ischium is a little more than half as long as the merus. The fifth pereiopod is somewhat more slender than the third. The last three pairs of pereiopods bear no spinules except those on the posterior margin of the propodus.

The pleopods and the uropods are of the usual shape.

The eggs are few and large, they measure 1.2 to 1.8 mm.

Very strange in the present species is the large variability of the shape of the second legs. Generally the carpus is very short, being almost cupshaped and very much shorter than (up to half as long as) the merus. Sometimes, however, it is more elongate, being $^{2}/_{3}$, $^{4}/_{5}$ or even almost as long as the merus. Also the fingers vary much in length. This variability is not linked to geographical

or to ecological factors, as it is observed in Malacca, Sumatra, Java, as well as in Borneo and specimens with long and short carpus and with long and short fingers occur side by side in material collected at one locality, moreover gradual transitions are observed. I therefore see no reason whatever to maintain the varieties *leptodactylus* De Man and *malayanus* J. Roux, which are based on Javanese and Malaccan material respectively in which the carpus is more elongate.

J. Roux's (1928a) new species *Palaemon pygmaeus* from Bawean is based on not full grown specimens of the present species. I have at my disposal a large number of prawns from the type locality of *P. pygmaeus,* which undoubtedly belong to the same species as J. Roux's specimens, as is shown by comparing them with J. Roux's description and figures. Like J. Roux's specimens, my material also does not attain a size larger than 19 mm. I can not find any difference between my specimens and young specimens of *M. pilimanus* from Java, the shape of the rostrum and its formula is quite the same, the second legs show all characters of those of *M. pilimanus* (the haired fingers, the dentition of the cutting edges, which, just like in the young specimens of *M. pilimanus,* is only visible in the proximal part, and in the relation between the lengths of the joints). Also in other less important points there is a close resemblance. J. Roux thought his specimen full grown, as among his material an ovigerous female of 16 mm length was present. In my Bawean material no ovigerous females occur. As I have already pointed out (p. 104) and as is also observed by various older authors, it is a well known fact that sometimes not full grown specimens of a *Macrobrachium* species are sexually mature. This also is the case with *M. pilimanus,* of which species in the material from the Singkarak Lake I found an ovigerous female, which actually like J. Roux's specimen measured 16 mm, this however is an exception, since ovigerous females generally are much larger (about 40 mm). In the light of this evidence it is impossible, in my opinion, to treat *Palaemon pygmaeus* J. Roux as a distinct species.

The specimens from Java mentioned by Miers (1880)without giving them a specific name, probably belong here, but too few characters are given by the British author to make this supposition certain.

The material of both Musea collected by M. Weber and that from the Bataklanden (Mus. Amsterdam) has already been dealt with by De Man (1892), that from the Central Sumatra Expedition is the type material and has been treated by De Man (1879 and 1887). The specimens from the Borneo Expedition have been dealt with by De Man (1898).

Distribution: This typical freshwater species is found at altitudes between 250-2500 m, it is known from the Malay Peninsula, and from the larger Sunda Islands: Sumatra, Java and Borneo. The records in literature are: Lasah, Plus Valley, E. Perak, Malay Peninsula (J. Roux, 1934), Blimbing River, Trengganu, Malay Peninsula (Lanchester, 1901), Aring River, Kelantan, Malay Peninsula (Lanchester, 1901), Tadi River and Ban Ta Yai, Nakorn Sritamarat, Siamese Malay States (Suvatti, 1937), Bataklanden, N. Sumatra (De Man, 1892), Manindjau Lake, W. Sumatra (De Man, 1892), Airteganang, between Fort de Kock and Padangpandjang, W. Sumatra (De Man, 1892), Airmantjur, S. of Padangpandjang, W. Sumatra (De Man, 1892), Kajutanam, S. of Padangpandjang (De Man, 1892), Singkarak Lake, W. Sumatra (De Man, 1892; J. Roux, 1932), Subang Pass (J. Roux, 1932), Danau-di-baruh Lake, W. Sumatra (De Man, 1892), Danau-di-atas Lake, W. Sumatra (De Man, 1892; J. Roux, 1932), Alahanpandjang, W. Sumatra (De Man, 1879, 1887), Silago, Central Sumatra (De Man, 1887), Muara-

labuh, W. Sumatra (De Man, 1879, 1887), Indrapura River, W. Sumatra (Ortmann, 1891), Kerintji Lake (Calman, 1925), Musi near Muaraklingi, Central Sumatra (J. Roux, 1932), Djermi River, near Tjurup, W. Sumatra (J. Roux, 1932), Ranau Lake, S.W. Sumatra (J. Roux, 1932), Java (Miers, 1880; Koningsberger, 1913), Buitenzorg, W. Java (De Man, 1892; Nobili, 1900; Rathbun, 1910; J. Roux, 1932), Tjibodas, Gede Mountain, W. Java (De Man, 1892; J. Roux, 1932), Tjinjiruan Quinine Gardens (not Tijnpruan), Puntjak-Gede, W. Java (Kemp, 1918a), Sinagar near Sukabumi, W. Java (De Man, 1892), Situ Bagendit near Garut, W. Java (De Man, 1892), Garut (Kemp, 1918a), Sarangan, Lawu Mountain, E. Java (J. Roux, 1932), Pasir Lake and Wurung Lake near Sarangan, E. Java (J. Roux, 1932), Ngebel Lake, Manjutan Mountain, E. Java (J. Roux, 1932), Lamongan Lake near Klakah, E. Java (J. Roux, 1932), Kastoba Lake, Bawean Island, Java Sea (J. Roux, 1928a), Bundutuan, Tenompok, and Renau, Mount Kinabalu Region, British North Borneo (Chace, 1938), Inuman River between Kalawat and Bungol, British North Borneo (Borradaile, 1900; Hanitsch, 1900), Matang and Sarawak, Sarawak (Nobili, 1901c), Sanggau and Sintang, Kapuas River, S.W. Borneo (De Man, 1898), Ketungau River and Upper Sibau River, tributaries of Kapuas River, S.W. Borneo (De Man, 1898), Nangaraun at Mandai River, tributary of Kapuas, S.W. Borneo (De Man, 1898).

Macrobrachium sulcicarpale nov. spec. (fig. 45)

Palaemon (*Parapalaemon*) *scabriculus* p.p. De Man, 1892, Weber's Zool. Ergebn., vol. 2, p. 462, pl. 27 fig. 41.

Museum Amsterdam

Bangkalan River, Salajar, S.E. of Celebes; 1888-1889; leg. M. Weber. — 1 specimen 47 mm.

De Man brought the present specimen and a damaged specimen from Tempe Lake, Celebes, to *Palaemon scabriculus*. The specimen from Tempe Lake is so damaged, that identification is not possible, but it certainly is no *M. scabriculum*. The other specimen in my opinion belongs to a new species and will be described here:

The rostrum (fig. 45a) is straight, reaching slightly beyond the antennular peduncle. The dorsal margin bears 15 equally spaced teeth, the first 6 of which are situated behind the orbital margin. The first tooth is placed slightly before the middle of the carapace. The lower margin bears two teeth in the middle, the distance between the distal tooth and the apex of the rostrum being about twice as long as the distance between the two teeth themselves. The carapace of my only (male) specimen is scabrous in the anterior part. The hepatic spine is placed much behind and below the antennal; the two spines are not situated in one line.

The abdomen is smooth and normally shaped. The fifth segment has the pleurae ending in a rather acute point. The sixth segment is 1.5 times as long as the fifth.

The telson is about 1.5 times as long as the sixth segment of the abdomen. Dorsally it bears the usual two pairs of spinules, which are situated in the middle and at $^3/_4$ of the length of the telson. My specimen is abnormal in possessing an additional spine in the right half of the telson, midway between the right posterior dorsal spine and the posterior margin of the telson. This posterior margin ends in an acute median point, which is flanked by the usual long inner and short outer posterior spines. Numerous setae are present.

The eyes have the cornea well developed. The antennulae have the usual shape.

The scaphocerite (fig. 45b) is about 2.5 times as long as broad. The outer margin is somewhat concave. The final tooth is rather strong, but is distinctly overreached by the lamella. The lamella has the antero-internal angle somewhat produced.

The oral parts are typical.

The first pereiopod reaches with the chela and a very small part of the carpus beyond the scaphocerite. The fingers are about as long as the palm. The carpus is twice as long as the chela and 5/4 as long as the merus. The ischium is about half as long as the merus. The second pereiopods are unequal in size. The right leg is the larger and reaches with the chela and a small part of the propodus beyond the scaphocerite. The fingers are about 1.5 times as long as the palm. In the

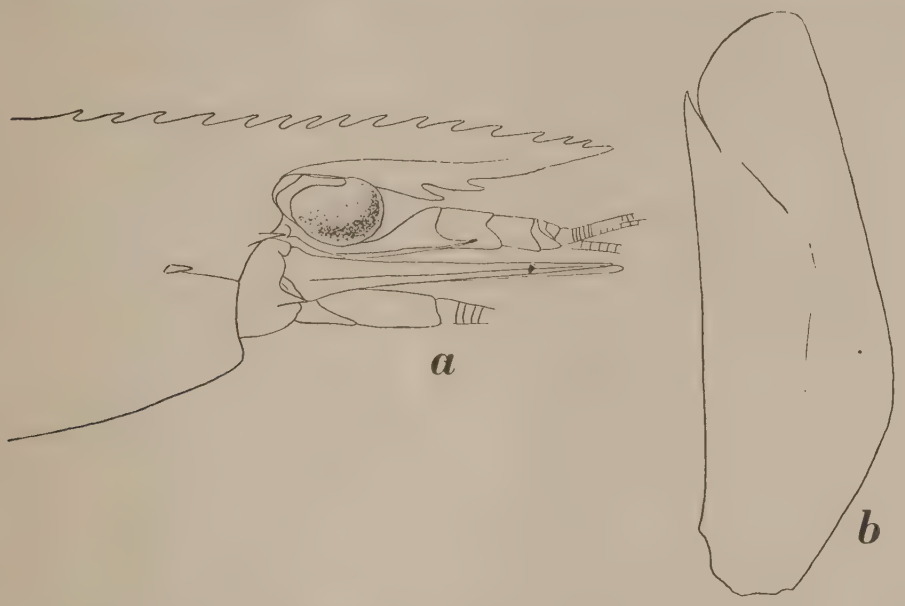

Fig. 45. *Macrobrachium sulcicarpale* nov. spec. a, anterior part of body in lateral view; b, scaphocerite. a, × 5; b, × 9.

proximal part of the cutting edge there is a rather large tooth. Between this tooth and the base of the edge some 4 or 5 smaller teeth are present, while 7 or 8 teeth are placed distally of them. The extreme distal part of the edge is entire, but this in all probability is due to the fact that the specimen is not yet entirely fullgrown. The palm is cylindrical and covered with numerous very small spinules. Velvety hairs are present at the palm and the base of the fingers. In the basal part of the palm the velvety hairs are absent. The carpus is somewhat longer than the palm and it gradually narrows proximally, it bears small spinules and long stiff hairs, no velvety pubescence can be observed. A very deep longitudinal groove is present on the upper as well as on the outer surface of the carpus (a feature not observed in *M. scabriculum* and *M. petersii*). The merus is only a trifle shorter than the carpus, it too is provided with spinules and some long hairs, just like the ischium, which is somewhat more than half as long as the merus. The smaller leg reaches only with a part of the palm beyond the scaphocerite. The fingers are 1.5 times as long as the palm and bear 3 to 5 teeth in the proximal part of their cutting edge. Long hairs are present on the palm and fingers, but no velvety pubescence is visible. The carpus is distinctly longer than the palm; it too is provided with two longitudinal grooves,

which, however, are not so distinct as in the large leg. The merus is about as long as the carpus and 1.5 times as long as the ischium. All three segments are covered with long hairs and small spinules. The third pereiopod just reaches beyond the apex of the scaphocerite. The propodus is almost thrice as long as the dactylus and somewhat less than twice as long as the carpus; it moreover is slightly shorter than the merus. The fifth leg by far fails to reach the end of the scaphocerite. The propodus is fully thrice as long as the dactylus and twice as long as the carpus. The merus is as long as the propodus. Except for the spinules at the posterior margin of the propodus, no spinules are present on the last three legs.

The pleopods and uropods are normal in shape.

The species shows much affinity to *M. scabriculum,* but may be distinguished at once by the shape of the rostrum and that of the second legs, especially the deeply grooved carpus is characteristic.

It is to be regretted that no more material of this species could be examined; then perhaps more characters should be found to separate this species from the allied forms.

Macrobrachium petersii (Hilgendorf) (fig. 46)

Palaemon (*s.s.*) *Petersii* Hilgendorf, 1879, Mber. Akad. Wiss. Berlin, 1878, p. 841, pl. 4 fig. 19.
Palaemon petersii Ortmann, 1891, Zool. Jb. Syst., vol. 5, p. 732.
Palaemon (*Parapalaemon*) *petersii* Weber, 1892, Zool. Jb. Syst., vol. 10, p. 166.
Palaemon (*Parapalaemon*) *petersi* Hilgendorf, 1898, Deutsch O. Afrika, vol. 4 pt. 7, p. 33.
Parapalaemon petersii Stebbing, 1910, Ann. S. Afr. Mus., vol. 6, p. 385.

Museum Amsterdam

Umhloti River, near Durban, Natal; 1894; leg. M. Weber. — 31 specimens (4 ovigerous females) 43-84 mm.

Umgeni River, near Durban, Natal; 1894; leg. M. Weber. — 7 specimens (2 ovigerous females) 34-58 mm.

Illovo River, Natal; 1894; leg. M. Weber. — 27 specimens (4 ovigerous females) 34-69 mm.

Description. The rostrum (fig. 46) is straight, it reaches about to the end of the scaphocerite and distinctly overreaches the antennular peduncle. The upper margin is evenly convex and bears 11 to 13 teeth, 3 or 4 of which are placed behind the posterior limit of the orbit. The distance between the first dorsal tooth and the orbital margin is $^1/_3$ or less than $^1/_3$ of the total length of the carapace (rostrum excluded). The teeth are regularly divided over the dorsal margin of the rostrum, though the first tooth is slightly more remote from the second than the third is. The lower margin bears 3 (seldom 4) equally spaced teeth in the distal half. The carapace in the adult males is distinctly scabrous in the anterior half. In the females and young males it is smooth. The hepatic spine is distinctly smaller than the antennal and is placed below and behind it; the two spines do not lie in one line.

The abdomen is smooth and normal in shape. The fifth segment has the pleurae ending in a bluntly angular point. The sixth segment is 1.5 times as long as the fifth.

The telson is normal in shape, it is somewhat less than 1.5 times as long as the sixth abdominal segment. The two dorsal pairs of spines are distinct and are placed in the middle and at $^3/_4$ of the length of the telson. The posterior margin ends in an acute median point, which mostly is broken in adult specimens, while the usual 2 pairs of posterior spines flank the apex, the inner spines far overreaching it. Numerous setae are present between the inner spines.

The eyes and antennules are normal.

The scaphocerite is almost thrice as long as broad. The outer margin is somewhat concave. The final tooth is rather small and is far overreached by the lamella, which has a rather blunt antero-internal angle.

The oral parts are quite typical.

The first pereiopods are slender and reach with the chela and a very small part of the carpus beyond the scaphocerite. The fingers are about as long as the palm. The carpus is twice as long as the chela. The merus measures $^3/_4$ of the length of the carpus. The ischium is slightly more than half as long as the merus. The second pereiopods are very unequal in the adult male. The larger leg reaches with the carpus and even a small part of the merus beyond the scaphocerite. The fingers are elongate, in old specimens they are about as long as or even somewhat longer than the palm, in young specimens they are shorter. In young specimens the fingers are straight and close over their entire length, in large

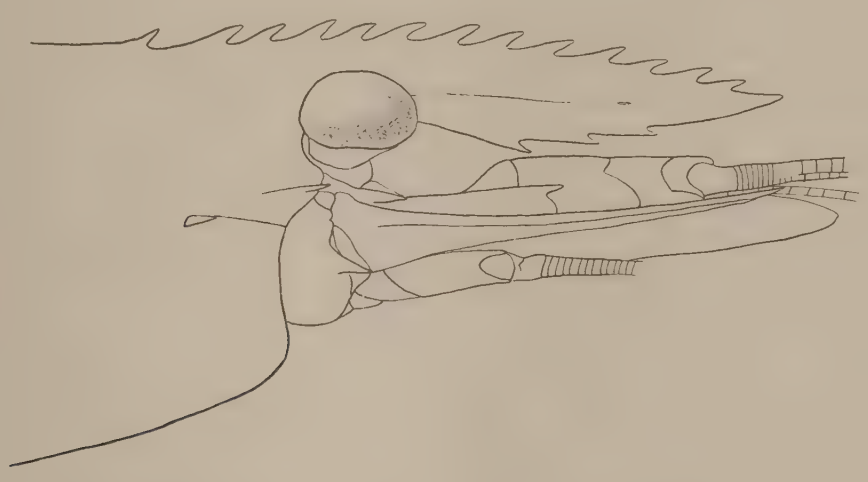

Fig. 46. *Macrobrachium petersii* (Hilgendorf). Anterior part of body in lateral view. × 5.

males the fixed finger is straight, while the dactylus is strongly curved, the fingers thus are gaping. The cutting edge of the fingers are provided with one large proximal tooth, behind which about 4 or 5 smaller teeth are present, while distally of this larger tooth the edge is provided with about 10-16 smaller teeth, which are regularly divided over that part of the edge. The palm is elongate and only slightly compressed. Small spinules are present on the palm, but lack on the fingers. The palm is covered with a thick layer of velvety hairs; this coat of hairs ends a small distance before the articulation with the dactylus, both fingers are naked. The carpus is about $^3/_4$ to $^1/_1$ as long as the palm and is provided with spinules and a thick coat of velvety hairs too. The merus is as long as or slightly shorter than the carpus and like that joint bears a thick coat of hairs. The ischium is less than half as long as the merus and also bears velvety hairs and spinules. The smaller leg reaches with a part of the carpus only beyond the scaphocerite. The fingers are about as long as or somewhat shorter than the palm, they are straight and close over their entire length, some 2 to 5 teeth are present in the proximal part of the cutting edge, which for the rest is entire. The palm is cylindrical and bears some very minute spinules. Scattered stiff hairs are present on the palm and fingers, but no velvety hairs are observed. The carpus is 1.5 times as long as the palm and about as long as the merus. The ischium is half as

long as the merus. In contradistinction to the chela, the ischium, merus and carpus are provided with a thick coat of velvety hairs, just like in the larger leg. In young males the chelae are not so strongly developed, while also the differences between the right and left legs are not so pronounced. In specimens of 40 to 50 mm the difference between the legs becomes visible, first in the size, afterwards also in the shape. In a male specimen of 43 mm the second legs are subequal, the right being somewhat smaller than the left (it reaches with part of the palm beyond the scaphocerite, while the left leg extends beyond that scale with a small part of the carpus). The fingers are as long as the palm and close over their entire length, in the proximal part of the cutting edge an indication of two teeth is visible. The carpus is distinctly longer than the palm. The merus is as long as the carpus, while the ischium is somewhat more than half as long as the merus. No velvety hairs are present. In the ovigerous females, which are much smaller than the largest males (49 to 52 mm) the second legs are equal in shape. These legs reach with the chela beyond the scaphocerite. Their shape is like that of the second legs of the young males, described above. In a large ovigerous female from the Umgeni River (58 mm long) the entire cutting edge of the fingers of the second legs is provided with teeth, the fingers are shorter than the palm. The third pereiopod reaches about to the end of the scaphocerite. The dactylus is slightly less than half as long as the propodus, while the carpus is slightly more than half as long as the latter joint. The merus is distinctly longer than the propodus, the ischium is slightly more than half as long as the merus. The fifth leg distinctly fails to reach (or sometimes just reaches to) the tip of the scaphocerite. The propodus is thrice as long as the dactylus and about twice as long as the carpus. The merus is about as long as the propodus.

The pleopods and uropods are normal in shape.

The eggs are numerous and are 0.4 to 0.6 mm in diameter.

The present species, as already pointed out by other authors, is closely related to *M. scabriculum* (= *P. dolichodactylus*). It may be distinguished immediately from that species, however, by the shape and pubescence of the second legs of the adult males. These legs are much more unequal in the present species than in *M. scabriculum*; in large males of the former species the chelae are strongly gaping by having the dactylus curved, in those of the latter the fingers generally are meeting over the entire length when closed. In *M. petersii* the fingers of the second leg of the adult male are entirely naked, the velvety pubescence not fully extending to the end of the palm, while in *M. scabriculum* the chelae are velvety pubescent up to the basal part of the fingers. In the latter species velvety hairs are absent from carpus, merus and ischium of both the larger and smaller leg, in *M. petersii* this pubescence is present on those joints of both legs. In my material of *M. petersii* furthermore the final tooth of the scaphocerite is much smaller and does not reach as far forward as in my material of *M. scabriculum*.

The present material of the Amsterdam Museum has already been mentioned by W e b e r (1897).

Distribution: *Macrobrachium petersii* is known only from the S.E. coast of Africa, where it is found in fresh water. The records in literature are: Tete, Mozambique (H i l g e n d o r f, 1879, 1898), Umhloti, Umgeni and Illovo Rivers, Natal (W e b e r, 1897).

Macrobrachium scabriculum (Heller)

Palaemon scabriculus Heller, 1862a, Verh. zool.-bot. Ges. Wien, vol. 12, p. 527.
Palaemon scabriculus Heller, 1865, Reise Novara Zool., vol. 2 pt. 3, p. 117, pl. 10 fig. 9.

Palaemon (*s.s.*) *dolichodactylus* Hilgendorf, 1879, Mber. Akad. Wiss. Berlin, 1878, p. 840, pl 4 fig. 18.
Palaemon scabriculus Ortmann, 1891, Zool. Jb. Syst., vol. 5, p. 710.
Palaemon dolichodactylus Ortmann, 1891, Zool. Jb. Syst., vol. 5, p. 732.
non *Palaemon* (*Parapalaemon*) *scabriculus* De Man, 1892, Weber's Zool. Ergebn., vol. 2, p. 462, pl. 27 fig. 41.
Palaemon scabriculus Koelbel, 1892, in De Man, Weber's Zool. Ergebn., vol. 2, p. 462 footnote.
Palaemon scabriculus Henderson, 1893, Trans. Linn. Soc. Lond. Zool., ser. 2 vol. 5, p. 442.
Palaemon (*Parapalaemon*) *scabriculus* De Man, 1897, Zool. Jb. Syst., vol. 9, p. 786.
Palaemon (*Parapalaemon*) *scabriculus* De Man, 1898, Zool. Jb. Syst., vol. 10, p. 708, pl. 37 fig. 73.
Palaemon (*Parapalaemon*) *dolichodactylus* Hilgendorf, 1898, Deutsch O. Afrika, vol. 4 pt. 7, p. 31.
Palaemon (*Eupalaemon*) *superbus* p.p. Coutière, 1900, C. R. Acad. Sci. Paris, vol. 130, p. 1266.
Palaemon (*Parapalaemon*) *dolichodactylus* Coutière, 1900, C. R. Acad. Sci. Paris, vol. 130, p. 1267.
Palaemon (*Parapalaemon*) *scabriculus* Nobili, 1900, Ann. Mus. Stor. nat. Genova, vol. 40, p. 483.
Palaemon dolichodactylus Coutière, 1901, Ann. Sci. nat. Zool., ser. 8 vol. 12, p. 283, pl. 11 figs. 18, 19.
Palaemon superbus p.p. Coutière, 1901, Ann. Sci. nat. Zool., ser. 8 vol. 12, p. 319, pl. 13 figs. 36, 37 (non figs. 34, 35).
Palaemon (*Parapalaemon*) *dolichodactylus* Coutière, 1902, Bull. Mus. Hist. nat. Paris, vol. 8, p. 516.
Palaemon (*Parapalaemon*) *scabriculus* Nobili, 1903, Boll. Mus. Zool. Anat. comp. Torino, vol. 18 n. 452, p. 12.
Palaemon (*Parapalaemon*) *dolychodactylus* Nobili, 1903, Boll. Mus. Zool. Anat. comp. Torino, vol. 18 n. 452, p. 13.
Palaemon scabriculus Henderson & Matthai, 1910, Rec. Indian Mus., vol. 5, p. 296, pls. 17, 18 fig. 7.
Palaemon dolichodactylus Henderson & Matthai, 1910, Rec. Indian Mus., vol. 5, p. 300, pl. 18 fig. 8.
Palaemon dubius Henderson & Matthai, 1910, Rec. Indian Mus., vol. 5, p. 300, pl. 18 fig. 9.
Parapalaemon dolichodactylus Stebbing, 1910, Ann. S. Afr. Mus., vol. 6, p. 385.
Palaemon (*Parapalaemon*) *dolichodactylus* Calman, 1913, Proc. zool. Soc. Lond., 1913, p. 926.
Palaemon scabriculus Kemp, 1915, Mem. Indian Mus., vol. 5, p. 272.
Palaemon dolichodactylus Colosi, 1918, Monit. zool. Ital., vol. 29, p. 105.
non *Palaemon* (*Parapalaemon*) *scabriculus* J. Roux, 1930, Rev. Suisse Zool., vol. 37, p. 361.
Palaemon (*Macrobrachium*) *dolichodactylus* J. Roux, 1934, Faune Colon. Franç., vol. 5, p. 534.
Palaemon scabriculus Panikkar, 1937, Journ. Bombay nat. Hist. Soc., vol. 39, p. 346.
Palaemon dolichodactylus Panikkar, 1937, Journ. Bombay nat. Hist. Soc., vol. 39, p. 346.
Palaemon dolichodactylus Nataraj, 1942, Curr. Sci., vol. 11, p. 468.
Palaemon (*Parapalaemon*) *dolichodactylus* Vatova, 1943, Thalassia, vol. 6 pt. 2, p. 12, pl. 1 fig. 4.

Museum Leiden

Sungai Pati Bubur, near Airbangis, Padangsche Benedenlanden (Padang Lowlands), W. Sumatra; fresh water; November, 1913; leg. E. Jacobson. — 7 specimens (included 1 ovigerous female) 26-43 mm.

Macrobrachium scabriculum is an extremely variable form, especially with regard to the shape of the second pereiopods of the male. Henderson & Matthai (1910) already pointed out that is very probable that the three forms, which they distinguished as *Palaemon scabriculus, P. dolichodactylus* and *P. dubius,* belong to one species as transitions between the extremes occur and moreover as the three forms often are found together. Taking the large variability of the shape of the chelae of allied species (e.g. *M. latidactylus* and *M. pilimanus*) into account, I entirely agree with their supposition and see no reason to keep the forms separated. The chelae of all three forms have the same construction, but differ only in the relation between the lengths of the various joints and that between length and breadth of those joints. In *M. pilimanus* we also find a large variability in

the relation between the length of the fingers and the palm of the second leg in the male and also the relation between the length and breadth of the carpus in that species is more variable than in most forms.

Henderson & Matthai rather extensively deal with the present species of which they moreover give good figures. I should like to add the following details:

The first tooth of the rostrum is placed so, that the distance between that tooth and the posterior margin of the orbit is $^1/_3$ to $^2/_5$ of the length of the entire carapace (rostrum excluded). The hepatic spine is placed behind and below the antennal and is directed parallel to it, but the two spines do not lie in one line.

The abdomen is normal in shape. The pleura of the fifth abdominal segment is rounded at the tip. The telson is normal.

The eyes and antennulae have the usual shape.

The scaphocerite reaches slightly beyond the rostrum, it narrows slightly anteriorly. The outer margin is concave. The final tooth is long and slender, it reaches to or somewhat beyond the end of the lamella.

The oral parts are typical.

The first pereiopods reach with the chela and a very small portion of the carpus beyond the scaphocerite. The fingers are as long as the palm. The carpus is twice as long as the chela and $^7/_5$ as long as the merus. The second pereiopods have been extensively described by Henderson & Matthai. My specimens agree good with the description given by these authors. The relation between the fingers and the palm is variable in my material; the chela mostly resembles the form named *scabriculus* by Henderson & Matthai, though the palm is somewhat more slender and the felt-like hairs cover a larger part of the fingers than shown in pl. 18 fig. 7d of these authors. In two of the larger chelipedes of the males in my material a trace of a blue coloration of the fingers is visible, the fingertips being white; in one of the chelae moreover a white band is visible in the distal part of the blue colour. The merus and carpus, though bearing some long setae lack the felty hairs of the palm. The third pereiopod just reaches the end of the scaphocerite (in young specimens it reaches with the dactylus beyond that scale). The propodus is thrice as long as the dactylus. The carpus is half as long as the propodus. The merus is slightly longer than the propodus. The fifth leg distinctly fails to reach the end of the scaphocerite. It is somewhat more slender than the third, though the relation between the lengths of the various joints is about the same.

The pleopods and uropods are of the normal shape.

The eggs of the female are 0.40 to 0.53 mm in diameter.

The specimens described by De Man (1892) as *Palaemon* (*Parapalaemon*) *scabriculus* could be examined by me. The larger specimen, namely that from Lake Tempe in Celebes, lacks both second legs and can not be identified with certainty, as is already remarked by De Man himself; it certainly, however, does not belong to the present species. The smaller specimen, which originates from Salajar, too belongs to another species. It is new in my opinion and has been described here as *Macrobrachium sulcicarpale* nov. spec. (vid. p. 220).

Coutière (1901) mentions *Palaemon superbus* from Madagascar. As already pointed out (p. 140) Coutière's identification is incorrect, because *M. superbum*, a species inhabiting China, is characterized by its slender and smooth second legs, the chelae of which bear no or at most 2 very small teeth on the cutting edges. The specimens from Madagascar referred by Coutière to

Heller's species undoubtedly belong to *M. scabriculum*. Coutière himself already pointed to the close relation between the two species, but thought them nevertheless distinct, because:

1. The carapace in *M. scabriculum* (named *Palaemon dolichodactylus* by him) is scabrous, while it is smooth in his "*superbus*" specimens.
2. The second legs in *M. scabriculum* are strongly unequal.
3. The second legs in *M. scabriculum* are much longer than the body.

All these characters, as is sufficiently shown by other species, are only due to age. The fact that Coutière's "*superbus*" specimens from Madagascar are young specimens of *M. scabriculum* is shown by their lengths (21.5 to 57.5 mm); the specimens identified by Coutière as *Palaemon dolichodactylus* measured 72 and 80 mm. In one of the detached chelae identified by Coutière as *P. superbus* the velvety hairs on the palm and the base of the fingers are already visible.

J. Roux (1930) described two ovigerous females from Lombok under the name *Palaemon (Parapalaemon) scabriculus*. These specimens in all probability have to be referred to *Macrobrachium latidactylus*, with females of which species they agree in every respect, and which species moreover is rather common at Lombok as is shown by the present material.

Distribution: The species up till now is only known with certainty from the region around the Indian Ocean. It lives in fresh water. The records in literature are: Juba, S. Italian Somaliland (Colosi, 1918; Vatova, 1943), "Région des grands lacs" (Coutière, 1902), Zanzibar (Hilgendorf, 1898; Coutière, 1901), Uzaramo, Tanganyika (Hilgendorf, 1898), Tete, Mozambique (Hilgendorf, 1879, 1898), Rio Kwakwa near Quelimane, Mozambique (Hilgendorf, 1898), Madagascar (Coutière, 1900, 1901), Kapiloza River and Bemazaka, Ambongo, N.W. Madagascar (J. Roux, 1934), Onilahy River, S.W. Madagascar (Coutière, 1900, 1901; Calman, 1913; J. Roux, 1934), Ivoloina near Tamatave, E. Madagascar (J. Roux, 1934), Fiheranena, Mantimaso River and Haut Kamoro, Madagascar [1]) (J. Roux, 1934), Kotri, near mouth of Indus River (Henderson, 1893), Nilambur Forest, Malabar District, S.W. India (Henderson & Matthai, 1910), Calicut and Palghat, S.W. India (Henderson & Matthai, 1910), Travancore (Nataraj, 1942), Ceylon (Heller, 1862a, 1865), Trichonopoly and Tanjore, S. India (Henderson & Matthai, 1910), Pondicherry (Nobili, 1903), Saidapet, Walajabad, Red Hills and Madras, S.E. India (Henderson & Matthai, 1910), Rambha, Chilka Lake (Kemp, 1915), Atjeh (= Atchin), N. Sumatra (De Man, 1897), Buabua, Enggano, off the westcoast of Sumatra (Nobili, 1900). Coutière's (1901) remark that the species according to Hilgendorf should occur in Natal, is erroneous, as in none of Hilgendorf's papers such a statement is made; Stebbing (1910) includes the species in his list of South African Crustacea on account of the above remark of Coutière.

Macrobrachium jacobsoni nov. spec. (fig. 47)

Museum Amsterdam

Lugu, Sinabang Bay, Simalur, off the westcoast of Sumatra; February, 1913; leg. E. Jacobson. — 7 specimens (3 ovigerous females) 38-77 mm.

Sinabang, Simalur; January, 1913; leg. E. Jacobson. — 1 specimen 43 mm.

Description. The rostrum (fig. 47a) is straight or directed somewhat downwards. The tip is slightly curved upwards. It reaches to or almost to the end of the scaphocerite. The upper margin

1) The exact position of these three localities is unknown to me; with Fiheranena perhaps Fiherenga, S.W. Madagascar is meant.

is straight or slightly convex above the eyes and bears 12 to 15 equidistant teeth, 5 or 6 of which are situated behind the posterior orbital margin. The first of these teeth is placed in the middle of the carapace. The lower margin of the rostrum bears 3 or 4 teeth; the distance between the last tooth and the apex of the rostrum generally is larger than that between the teeth themselves. The carapace of the adult male is scabrous in the anterolateral region. The antennal spine is strong and ends posteriorly in a carina. The hepatic spine is much smaller than the antennal and is placed behind and below it, close near the end of the antennal carina.

The abdomen is smooth and normal in shape, the apex of the pleura of the fifth segment is rounded. The sixth segment is about 1.5 times as long as the fifth.

The telson is about 1.5 times as long as the sixth abdominal segment, it is provided with the usual two dorsal pairs of spinules, which are placed in the middle and at $^3/_4$ of the length of the telson. The posterior margin of the telson ends in an acute median point, which bears at each side the usual short and long spines. The long inner spines overreach the tip of the telson and some feathered setae are present between them.

The eyes and antennulae are of the common shape.

The scaphocerite is about 2.5 times as long as broad. The outer margin is straight or somewhat convex, the final tooth is strong, directed slightly inwards and fails to reach the end of the lamella, which in its antero-internal angle is only slightly produced.

The oral parts are typical in shape.

The first pereiopod (fig. 47b) reaches with $^1/_4$ of the carpus beyond the scaphocerite (in young specimens it does not reach so far). The fingers are about as long as the palm. The carpus is twice (in young specimens less than twice) as long as the chela. The merus is $^3/_4$ as long as the carpus. The ischium is somewhat more than half as long as the merus. In the adult male the second legs are distinctly unequal in size, they are, however, of about the same shape. The larger leg (sometimes the right, sometimes the left) (fig. 47d) reaches with the chela (often also with part of the carpus) beyond the scaphocerite. The fingers are as long as or slightly longer than the palm and close over their entire length. In the proximal part of the cutting edge of the fixed finger a rather large tooth is present, proximally of which there are about 4 small teeth, while distally about 12 larger teeth are placed on the cutting edge. The cutting edge of the dactylus bears about 20 teeth of about equal size, no differentiation in one larger and many smaller teeth, as in the fixed finger, is visible, though generally the proximal teeth are smaller than the distals. The fingers are almost entirely naked and smooth, only close near the base some very small spinules may be observed and some few scattered short hairs are present. The palm is somewhat compressed and slightly swollen in the middle, it bears numerous small spinules over its entire surface, while moreover scattered long hairs are present. The outer surface of the palm bears a coat of velvety hairs, which is especially dense in the ventral region. This pubescence is absent in the distal part of the palm and on its inner surface. The carpus is short and conical, it is narrower than the palm and measures somewhat more than half the length of the palm, it bears numerous small spinules and scattered long hairs, no velvety pubescence is visible. The merus is slightly less than 1.5 times as long as the carpus, the ischium is half as long as the merus. Both merus and ischium show the same spinulation and hairs as the carpus. The smaller leg (fig. 47e) reaches only with part of the propodus beyond the scaphocerite. The fingers are distinctly longer than the palm, they close over their entire length and possess about 4 small teeth in the proximal part. Scattered long hairs are present on both palm and fingers, but no velvety pubescence is observed.

The carpus is about as long as the palm. The merus is slightly longer than the carpus; all joints bear long hairs and small spinules, which especially on the palm are very inconspicuous. In younger males the large leg resembles the smaller in the relations between the various joints. Ovigerous females have the second legs (fig. 47c) equal in shape and size; these legs strongly resemble the smaller leg of the male, only less hairs are present. The third pereiopod (fig. 47f) reaches with the entire dactylus or only part of it beyond the scaphocerite. The propodus is thrice as long as the dactylus. The carpus is somewhat more than half as long as the propodus, while the merus is distinctly longer than that

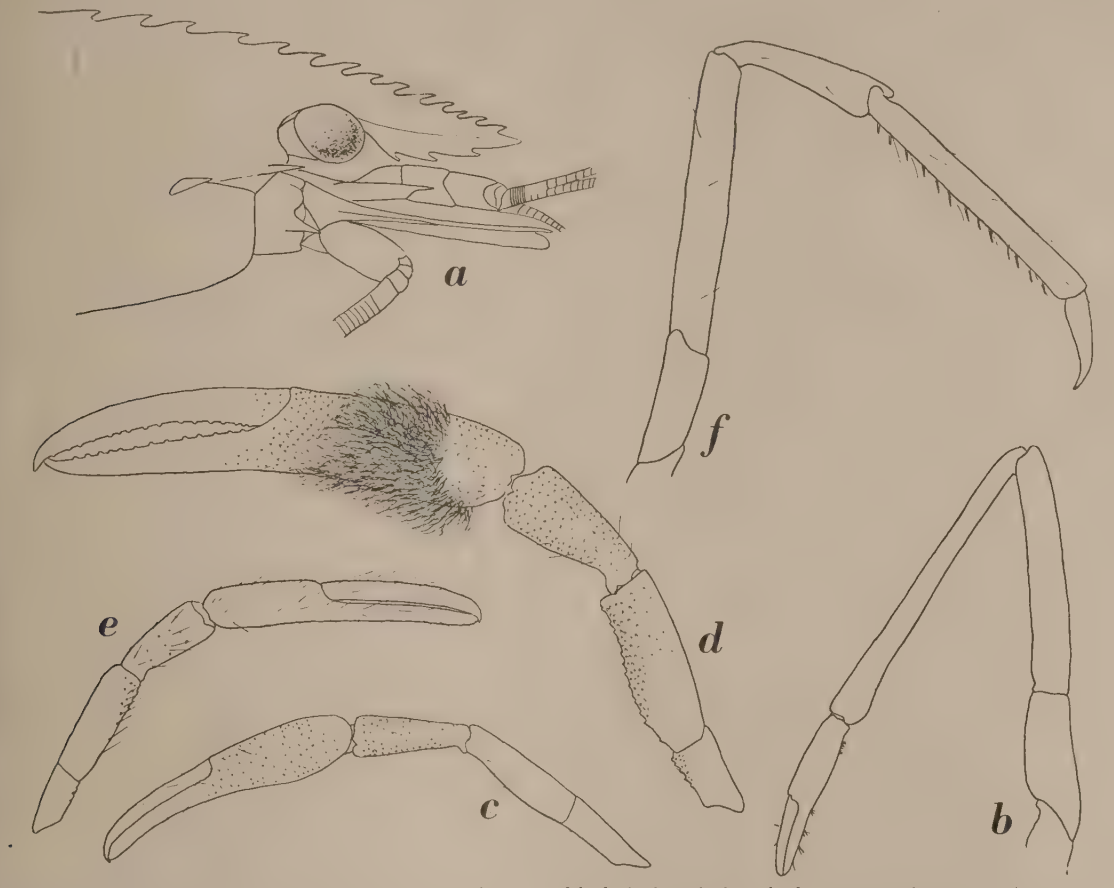

Fig. 47. *Macrobrachium jacobsoni* nov. spec. a, anterior part of body in lateral view; b, first pereiopod; c, second pereiopod of female; d, larger second pereiopod of adult male; e, smaller second pereiopod of adult male; f, third pereiopod. a, × 4; c-e, × 2; b, f, × 4.6.

joint. The fifth leg just reaches the end of the scaphocerite. The propodus is thrice as long as the dactylus, twice as long as the carpus and as long as the merus. Except for some hairs and the posterior spinules of the propodus, the last three legs are smooth.

The pleopods and uropods are normal in shape.

The eggs are 0.50 to 0.63 mm in diameter. The ovigerous females in my material are rather small, being 40 to 60 mm long.

Colour: In my spirit specimens some traces of the original colour still are visible. The first pereiopod has a bluish band across the base of the fingers. The fingers of the second pereiopod in the adult males are bluish or reddish with white patches or white transverse bands, the tips often are

white, sometimes the white colour is dominating, the bluish colour then being reduced to one or two narrow bands.

The present species differs from most allied species (*M. scabriculum, M. petersii, M. sulcicarpale* and *M. lorentzi*) by the very short and conical carpus of the second leg, in which character it resembles *M. pilimanus*; from the latter species, however, it differs in the pubescence of the chelae of the male and in the shape of the rostrum.

It gives me great pleasure to dedicate this pretty species to the memory of the late Dr. Edward Jacobson, who has contributed so much to our knowledge of the fauna of the Malay Archipelago, during his collecting trips throughout Java and Sumatra, and who discovered the present species at the island of Simalur.

Macrobrachium grandimanus (Randall)

Palemon grandimanus Randall, 1839, Journ. Acad. nat. Sci. Philad., vol. 8, p. 142.
Palemon gracilimanus Randall, 1839, Journ. Acad. nat. Sci. Philad., vol. 8, p. 143.
Palemon grandimanus Gibbes, 1850, Proc. Amer. Ass. Adv. Sci., vol. 3, p. 198.
Palemon gracilimanus Gibbes, 1850, Proc. Amer. Ass. Adv. Sci., vol. 3, p. 198.
Palaemon grandimanus Gibbes, 1850a, Proc. Acad. nat. Sci. Philad., 1850, p. 25.
Palaemon gracilimanus Gibbes, 1850a, Proc. Acad. nat. Sci. Philad., 1850, p. 25.
Palaemon grandimanus Dana, 1852, Proc. Acad. nat. Sci. Philad., vol. 6, p. 26.
Palaemon acutirostris Dana, 1852, Proc. Acad. nat. Sci. Philad., vol. 6, p. 26.
Palaemon grandimanus Dana, 1852a, U.S. Explor. Exped., vol. 13, p. 588.
Palaemon acutirostris Dana, 1852a, U.S. Explor. Exped., vol. 13, p. 590.
Palaemon acutirostris Weitenweber, 1854, Lotos Praha, vol. 4, p. 61.
Palaemon grandimanus Dana, 1855, U.S. Explor. Exped., vol. 13 atlas, p. 12, pl. 38 fig. 12.
Palaemon acutirostris Dana, 1855, U.S. Explor. Exped., vol. 13 atlas, p. 12, pl. 39 fig. 1.
non *Palaemon grandimanus* Von Martens, 1868, Arch. Naturgesch., vol. 34 pt. 1, p. 45.
Palaemon acutirostris Streets, 1877, Bull. U.S. Nat. Mus., vol. 7, p. 119.
Palaemon grandimanus Kingsley, 1882, Bull. Essex Inst., vol. 14, p. 107.
Bithynis grandimanus Bate, 1888, Rep. Voy. Challenger, Zool., vol. 24, p. 793, pl. 129 figs. 2, 3.
non *Palaemon acutirostris* De Man, 1888, Journ. Linn. Soc. Lond. Zool., vol. 22, p. 280, pl. 18 fig. 7.
Palaemon acutirostris Ortmann, 1891, Zool. Jb. Syst., vol. 5, p. 728 (non p. 707).
Palaemon grandimanus Ortmann, 1891, Zool. Jb. Syst., vol. 5, p. 736.
Palaemon acutirostris Sharp, 1893, Proc. Acad. nat. Sci. Philad., 1893, p. 121.
Palaemon gracilimanus Sharp, 1893, Proc. Acad. nat. Sci. Philad., 1893, p. 122.
Palaemon grandimanus Sharp, 1893, Proc. Acad. nat. Sci. Philad., 1893, p. 122.
Palaemon grandimanus Lenz, 1901, Zool. Jb. Syst., vol. 14, p. 436, pl. 32 figs. 4, 5.
Palaemon grandimanus Thompson, 1901, Catal. Crust. Mus. Dundee, p. 19.
Bithynis grandimanus Rathbun, 1906, Bull. U.S. Fish Comm., vol. 23 pt. 3, p. 923, pl. 22 fig. 5.
non *Palaemon grandimanus* Estampador, 1937, Philipp. Journ. Sci., vol. 62, p. 489.
Palaemon grandimanus Kubo, 1940, Journ. Imp. Fish. Inst. Tokyo, vol. 34, p. 18, textfig. 10, pl. 1 fig. C.

Museum Leiden

Honolulu, Oahu, Hawaiian Archipelago; December 13, 1917; leg. P. Buitendijk. — 10 specimens (6 ovigerous females) 51-66 mm.
? Sydney; leg. R. Schütte; coll. Mus. Göttingen. — 3 specimens 39-41 mm.
Locality unknown; leg. R. Schütte; coll. Mus. Göttingen. — 1 specimen 41 mm.

The rostrum is straight or has the tip curved slightly upwards, it reaches to or slightly beyond the end of the scaphocerite. The upper margin is convex in larger, straight or even slightly concave

in smaller specimens, it bears 14 to 17 (generally 14 or 15) teeth, which are regularly divided over the whole length, the first four or five teeth are placed behind the posterior limit of the orbit. The first tooth is slightly more remote from the second than the third is, it is placed somewhat before the middle of the carapace. The lower border bears 4 or 5 (in one abnormal specimen 7) teeth, the distance between the last tooth and the apex of the rostrum is larger than that between the teeth themselves. The rostrum is rather high, especially in the lower half. In the adult males the anterolateral part of the carapace is scabrous by numerous small spinules; in females and young males it is entirely smooth. The antennal spine is placed some distance below the rounded orbital angle and ends posteriorly in a short carina. The hepatic spine is distinctly smaller than the antennal and is placed obliquely behind it, lying almost in one line with it.

The abdomen is smooth (also in my adult male). The pleurae are of the normal shape, that of the fifth segment has the apex rounded. The sixth segment is about 1.5 times as long as the fifth.

The telson is distinctly longer than the sixth abdominal segment. It is smooth (also in my adult male) and has the two dorsal pairs of spines placed in the middle and at $^3/_4$ of its length. The apex of the telson ends in a sharp point which is distinctly overreached by the inner pair of posterior spines, the outer pair being very short. Numerous setae are present between the inner spines.

The eyes are large. The cornea is broader and slightly shorter than the stalk. The antennulae are normal.

The scaphocerite is slender, it is almost thrice as long as broad. The outer margin is concave. The final tooth is strong, but is overreached by the apex of the lamella, which has a bluntly angular antero-internal angle.

The oral parts are typical.

The first pereiopods reach about with the chela beyond the scaphocerite. The fingers are slightly shorter than the palm. The carpus is somewhat less than twice as long as the chela and is about $^5/_4$ of the length of the merus. The second pereiopods of the adult male are very unequal in shape. The larger leg reaches with about half the carpus beyond the scaphocerite. The fingers are slender, they are in my specimen about as long as the palm, in larger specimens (vid. R a t h b u n, 1906, pl. 22 fig. 5) they are much longer than the palm. The tips of the fingers are curved inwards. The surface of the fingers, as well as that of the palm is thickly covered with numerous very small spinules, which are placed up to the tips. The cutting edge of the dactylus possesses close near the articulation with the propodus two or three rather large teeth, which are placed close together and of which the distal is largest, then follows a large unarmed space (in the middle of this space a small denticle is visible in my specimen) at the end of which again a large tooth is present; between this tooth and the apex of the finger numerous (in my specimen 17) small teeth of about equal size are placed, these teeth become smaller distally. The cutting edge of the fixed finger is similarly armed, here only the gap between the two large teeth is much shorter than in the dactylus, so that the distal large tooth of the dactylus lies more anteriorly than that of the fixed finger, the proximal large teeth of both fingers being situated just opposite one another. The palm is rather high, being never more than 2.5 times as long as high and being highest in the proximal part; the palm is somewhat compressed (the relation between the height and length being 2: 3). Just like the fingers the palm is covered with numerous small denticles over the entire surface. In the basal part of the palm, especially in the lower half, numerous long hairs, which are placed close together, are present. The carpus is slightly shorter than the palm, it narrows proximally and is somewhat less than thrice as

long as its greatest (= anterior) breadth. Like the palm it is covered with minute spinules. The merus is slightly shorter than the carpus, the ischium is about half as long as the merus, both joints are covered with many small spinules. The smaller second leg in my large male specimen reaches with the entire chela and a very small portion of the carpus beyond the scaphocerite. The fingers are very long and slender, they are about twice as long as the palm and are strongly gaping; the cutting edges bear no or only very inconspicuous teeth, while long and stiff hairs, which are directed inwards, are placed on the cutting edge of the fingers, shorter hairs are present on the rest of the surface. The palm is of the same breadth throughout its length and is about twice as long as broad. The carpus is about 1.5 times as long as the palm, it narrows posteriorly. The merus is slightly shorter than the carpus, the ischium is somewhat more than half as long as the merus. In the female and the young males the second legs are equal in shape, they are moreover more slender than in the male. The chela and part of the carpus reach beyond the scaphocerite. The fingers are slender and about as long as the palm. The cutting edge is entire but for some 3 or 4 inconspicuous teeth near the base, in young specimens these teeth are not yet visible. The fingers close over their entire length. The palm is about 4 times as long as broad and of about the same breadth throughout its length. The carpus is about as long as the palm and half the length of the fingers together, in younger specimens it even is relatively longer. The merus is slightly shorter than the carpus. The ischium is shorter than the merus. The entire leg is covered with minute spinules, which are very indistinct in young specimens. The third leg reaches with only part of the dactylus beyond the scaphocerite. The propodus is about 2.5 times as long as the dactylus. The carpus is more than half as long as the propodus. The merus is somewhat longer than the latter joint. The ischium is about half as long as the merus. The fifth leg just fails to reach the end of the scaphocerite. The propodus is thrice as long as the dactylus, the carpus is slightly more than half as long as the propodus, while the merus has the same length as the propodus, the ischium is slightly more than half as long as the merus. The propodus of all three legs bears the usual posterior spines, that of the fifth leg moreover is provided with transverse rows of setae.

The pleopods and uropods are normal in shape.

The eggs are numerous and small, they are 0.6 to 0.7 mm in diameter.

Palaemon acutirostris Dana is based on female and young specimens of the present species as is already pointed out by R a t h b u n (1906).

Palaemon gracilimanus Randall undoubtedly also belongs to the present species, it probably is based on a female specimen.

The specimens said to be collected by R. S c h ü t t e (Museum Leiden) probably are incorrectly labelled, as is the case with a large part of the material obtained by the Leiden Museum from the Göttingen Museum; *M. grandimanus* namely is not known from Australia.

The specimens from the Philippines identified by V o n M a r t e n s (1868) as *Palaemon grandimanus* do not belong there, but are *Macrobrachium latidactylus* (vid. p. 244). E s t a m p a d o r's record of *"Palaemon grandimanus"* from the Philippines is based on V o n M a r t e n s's statement.

K u b o (1940) described this species from the Riukiu Islands. The only difference between his material and Hawaiian specimens seems to be that in the Japanese specimens the rostral formula is $\frac{11-15}{3}$, while this formula in Hawaiian material is $\frac{14-17}{4-5}$.

Distribution: Up till 1940 the species was considered to be endemic in the Hawaiian Islands. It furthermore is there the only representative of the genus *Macrobrachium* (as already pointed out

on p. 190, Armstrong's record of *Macrobrachium lar* from the Hawaiian Archipelago almost certainly is due to incorrect labelling of his specimen). In 1940 Kubo reported upon specimens collected in 1936 in one of the Riukiu Islands, which evidently belong to the present species; this is the first authentic record of the species outside the Hawaiian Archipelago. The records in literature are: Sira-kawa, Hora-gawa, and Simozi, Miyako Island, Riukiu Islands (Kubo, 1940), Hawaiian Islands (Randall, 1839; Dana, 1852; Weitenweber, 1854; Streets, 1877; Ortmann, 1891; Sharp, 1893), Waimea River, Hanalei River, Hauapepe River and Huleia River, Kauai (Rathbun, 1906), Honolulu, Oahu (Bate, 1888; Thompson, 1901; Rathbun, 1906), Kalihi, Oahu (Lenz, 1901), Waianae, Heeia, and Kaneoke Cove, Oahu (Rathbun, 1906), Mauna Loa, Waiakla River and Hilo, Hawaii (Rathbun, 1906), Opae Oehaa (Rathbun, 1906).

Macrobrachium joppae nov. spec. (fig. 48)

Museum Amsterdam

Nias; leg. J. P. Kleiweg de Zwaan. — 9 specimens (1 ovigerous female) 31-54 mm.

Description. The rostrum (fig. 48a) has the midrib slightly turned upwards near the tip, but the upper margin is straight. Anteriorly the rostrum reaches distinctly beyond the antennular peduncle, but fails to reach the end of the scaphocerite. The upper margin bears 13 to 15 equidistant teeth, the first 4 or 5 of which are placed on the carapace behind the orbit. The first tooth is somewhat smaller than the second and the distance between these two teeth is slightly larger than that between the other teeth. The first tooth is placed some distance before the middle of the carapace. The lower margin bears 4 or 5 teeth, which are placed closest together in the proximal part and widest in the distal part of that margin. The rostrum is, when compared with *M. hirtimanus, M. placidulum* and *M. placidum,* rather high, resembling more the shape of the rostrum in *M. grandimanus.* In my adult males the carapace is scabrous by the presence of numerous small spinules, which are most distinct in the anterolateral and least distinct in the posteromedian region of the carapace. The hepatic spine is placed behind and a small distance below the antennal and is slightly less strong than the latter. The two spines do not lie in one line.

The abdomen is smooth, even in the large males. The pleurae have the usual shape; the apex of the fifth pleura is more or less acute. The sixth abdominal segment is somewhat more than 1.5 times as long as the fifth.

The telson is about 1.5 times as long as the sixth abdominal segment. Of the two dorsal pairs of spines the first is situated in the middle of the telson, the other lies halfway between the anterior pair and the posterior margin of the telson. This posterior margin ends in a distinct sharp median point, which is flanked by two pairs of spines, the outer of which is very short, the inner pair is about 3 to 4 times as long as the outer and distinctly overreaches the apex of the telson. Between the inner spines numerous setae are present.

The eyes are large, the cornea is broad and kidney-shaped, it is broader than and about as long as the stalk.

The antennulae are of the normal shape.

The scaphocerite (fig. 48b) is slender; it is thrice as long as broad. The outer margin is slightly concave and ends in a strong final tooth, which almost overreaches the more or less truncate anterior end of the lamella.

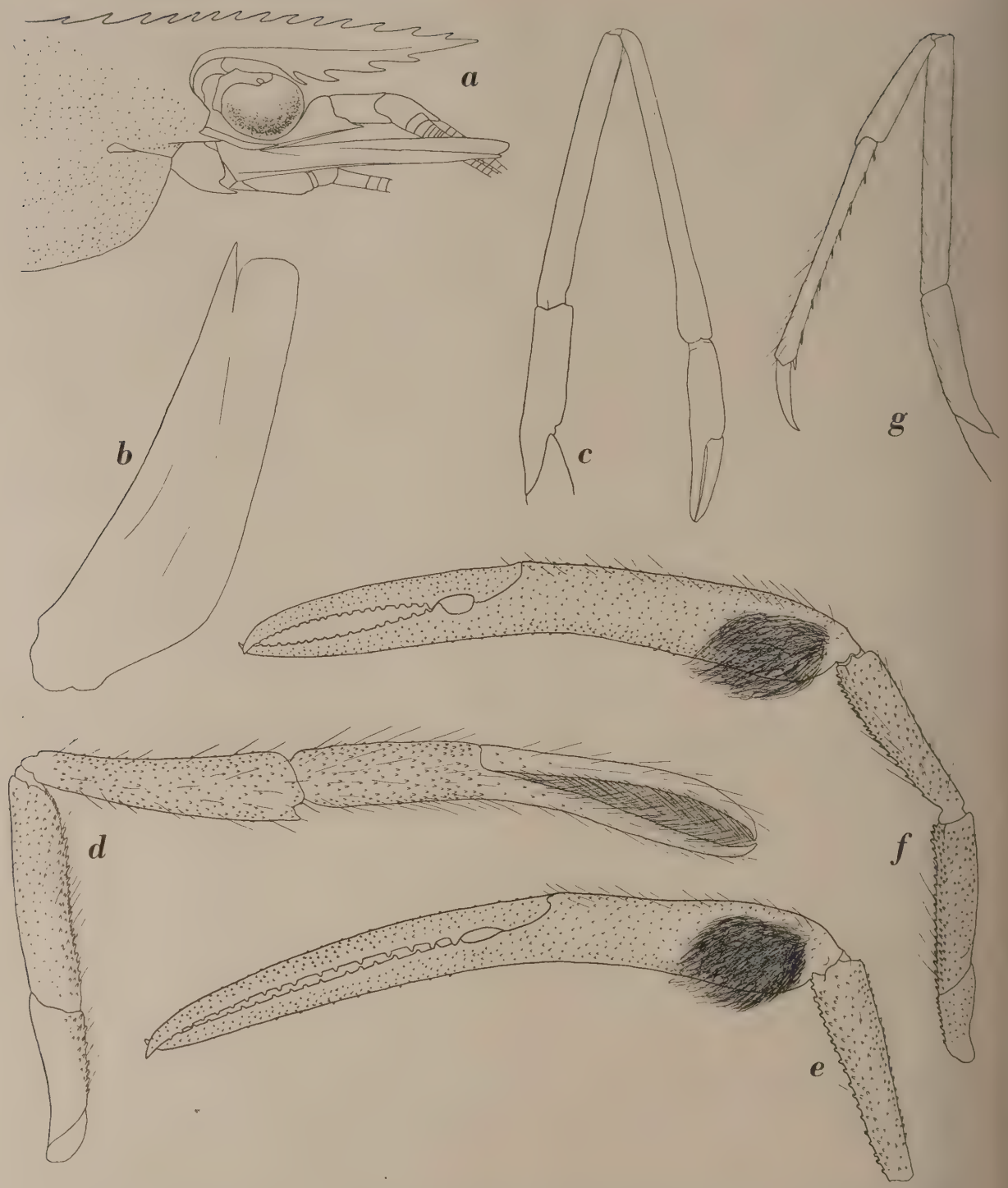

Fig. 48. *Macrobrachium joppae* nov. spec. a, anterior part of body in lateral view; b, scaphocerite; c, first pereiopod; d, smaller second pereiopod of adult male; e, f, larger second pereiopods of adult males; g, third pereiopod. a, d, g, × 5.5; b, c, × 8; e, × 2.7.

The oral parts are quite typical.

The first pereiopods (fig. 48c) are slender, they reach with the entire chela or with part of it beyond the scaphocerite. The fingers are about as long as the palm. The carpus is somewhat less than twice as long as the chela. The merus measures about 4/5 of the length of the carpus. The ischium is somewhat more than half as long as the merus. In the adult male the second pereiopods are very unequal. The larger leg (figs. 48e, f) reaches with the carpus and the chela beyond the scaphocerite. The fingers are very long and slender, they are 3/4 to 4/3 as long as the palm. In the very proximal part the fingers close perfectly; at the end of this short distance, in which the cutting edges touch each other, one or two rather large teeth are present, then follows a distinct, but rather short gap in which the cutting edges are unarmed and are strongly concave. This gap is terminated in each finger by a rather large tooth; these two teeth are placed just opposite one another. The distance from these teeth to the base of the fingers is about one half to one third of the distance to the apex. Between the distal large teeth and the apex of the fingers, each cutting edge is provided with many (about 20) small teeth, which are placed at regular distances. The palm is cylindrical and slender, it is about thrice or more than thrice as long as broad. The palm as well as the fingers are scabrous by numerous spinules, which, however, towards the tips of the fingers become small and inconspicuous. Numerous closely packed long and soft hairs are placed in the lower part of the basal portion of the palm. Long and slender hairs, which are longer and more stiff than the hairs just mentioned and not so closely placed together, are present in the upper part of the basal portion of the palm. The carpus is slender, it is much narrower than the palm and measures 2/3 of the length of the palm, it narrows posteriorly. The merus is as long as or slightly shorter than the carpus. The ischium is about half as long as the carpus. The ischium, carpus and merus are provided with numerous spines, which are largest in the lower portion, furthermore similar hairs as are present on the upper part of the palm are present on these three joints. The smaller leg (fig. 48d) reaches only with part of the carpus beyond the scaphocerite. The fingers are long and slender and gape throughout their length. They are 1.5 times or slightly more as long as the palm. The cutting edges of the fingers bear two or three teeth close near their base. Long and rather stiff hairs are present at both sides of the cutting edges. The palm is about 2.5 to 3 times as long as broad, it is of the same width throughout its length. Small spinules are present on the palm and the bases of the fingers. The carpus is about 4/3 as long as the palm, it narrows posteriorly. The merus is about as long as or slightly shorter than the carpus. The ischium is somewhat more than half as long as the merus; spinules and scattered long hairs are present on ischium, merus and carpus. No soft hairs as on the palm of the larger leg are present here. Of the two females at my disposal, one misses both second legs, in the other only the right leg is present. The fingers are slender and close over their entire length, they show some two or three inconspicuous denticles in the proximal part of the cutting edges. The palm is slightly longer than the fingers and is cylindrical, it is about 2.5 times as long as broad. The carpus is about 5/4 as long as the palm, it narrows proximally. The merus is somewhat shorter than the carpus and the ischium is almost as long as the merus. All joints, except the distal part of the fingers, are provided with minute spinules, while some scattered long hairs are present too. It is very probable, taking the close relation between the present species and *M. grandimanus* into account, that the second legs of the female are equal in shape and size. The third pereiopod (fig. 48g) reaches about to the end of the scaphocerite, sometimes it overreaches that scale with the dactylus. The propodus is 2.5 to 3 times as long as the dactylus, and bears a row of 6 to 10 spinules at the posterior margin. The carpus is about half as long as the

propodus or is somewhat longer. The merus is slightly longer than the propodus. The ischium is about half as long as the merus. The fifth pereiopod reaches to or just fails to reach to the end of the scaphocerite. The relation between the lengths of the various joints are as in the third leg, though they are more slender in the fifth leg; here of course the transverse rows of setae are present in the distal part of the posterior margin of the propodus.

The pleopods and the uropods are normal in shape.

The ovigerous female measures 31 mm. The eggs are rather numerous and small, they are 0.6 to 0.8 mm in diameter (the embryos are already visible).

The present species is most closely related to *M. grandimanus* (Randall) from the Hawaiian Archipelago. From this species, however, it at once may be recognized by the shape of the large chela of the adult male.

Macrobrachium bariense (De Man) (fig. 49)

Palaemon (*Macrobrachium*) *bariensis* De Man, 1892, Weber's Zool. Ergebn., vol. 2, p. 496, pl. 29 fig. 50.
Palaemon bariensis Schenkel, 1902, Verh. naturf. Ges. Basel, vol. 13, p. 511.
Palaemon (*Macrobrachium*) *bariensis* J. Roux, 1919, Abh. Senckenb. naturf. Ges., vol. 35, p. 341.
Palaemon (*Macrobrachium*) *bariensis* p.p. J. Roux, 1923, Capita Zool., vol. 2 pt. 2, p. 10.
Palaemon (*Macrobrachium*) *bariensis* J. Roux, 1928a, Treubia, vol. 10, p. 219.

Siboga Expedition

River near Station 53, Bay of Nangamesi, Sumba; April 21 and 22, 1899. — 28 specimens 14-36 mm.
River near Station 114, Kuandang Bay, N. Celebes; July 8, 1899. — 10 specimens 15-30 mm. (badly preserved).

Museum Amsterdam

Pajeti, Sumba. — 9 specimens (5 ovigerous females) 32-55 mm.
River near Berit (= Bari), W. Flores; 1888-1889; leg. M. Weber; cotypes of *Palaemon bariensis* De Man. — 6 specimens (2 ovigerous females) 24-33 mm.
River near Konga, E. Flores; leg. G. A. J. van der Sande. — 1 specimen 47 mm.
Waiho River, Waigeo; in freshwater, upstreams of rapids; December 20, 1909; leg. L. F. de Beaufort. — 6 specimens 26-36 mm.

This characteristic small species has already been described and figured by De Man (1892). I should like to add the following details to De Man's description:

The scaphocerite is about 2.5 times as long as broad. The outer margin is straight or slightly concave. The final tooth is strong and reaches to or even slightly beyond the lamella, which has the antero-internal angle inconspicuously produced.

The oral parts are quite normal.

The first leg reaches with half the carpus beyond the scaphocerite. The fingers are about as long as the palm. The carpus is almost twice as long as the chela. The merus measures $^4/_5$ of the length of the carpus. The ischium is about half as long as the merus. The second legs are strongly unequal (sometimes the left is the larger, sometimes the right; De Man's (1892) statement that the left always is the larger is incorrect). The larger leg reaches with part of the carpus beyond the scaphocerite. The fingers in the adult male are as long as to distinctly shorter than the palm. The fingers

bear in the proximal part of the cutting edge one rather large tooth, distally of which there are 4 to 6 slightly smaller teeth, regularly divided over the cutting edge; proximally of the large tooth of the dactylus there are about 3 teeth, while the fixed finger bears a crenulated crista at that place. Except for some scattered hairs, the chela is naked, there are numerous small conical tubercles placed on the palm and the basal part of the fingers. The palm is distinctly broadened and compressed. The upper margin is rounded, but near the lower margin the palm is suddenly so strongly compressed, that a more or less sharp keel is formed. The carpus is short and conical, it is about half as broad as and distinctly shorter than the palm. The merus is slightly longer than the carpus. The ischium measures $^2/_3$ of the length of the merus or somewhat less. The smaller leg (fig. 49) reaches with the chela beyond the scaphocerite. The fingers are slender, they are from 1.5 times to almost twice as long as the palm. In large males they are gaping and provided with inwards directed hairs. The cutting edge possesses 4 to 6 small teeth in the extreme proximal portion. The palm is not broadened and bears a

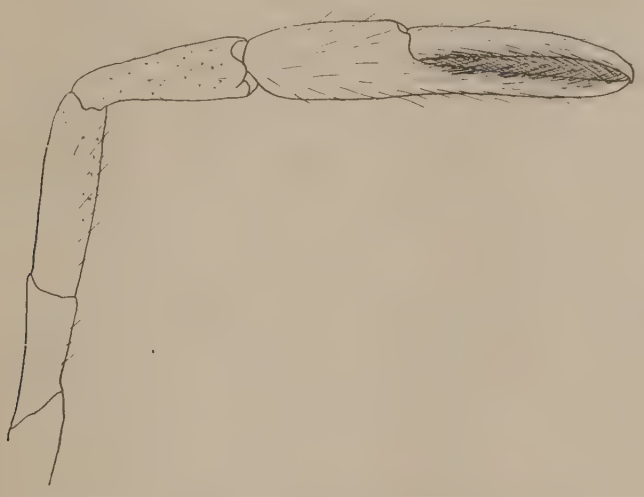

Fig. 49. *Macrobrachium bariense* (De Man). Smaller second leg of adult male. × 6.

few scattered tubercles and long hairs. The carpus is about as broad and as long as or slightly longer than the palm, it too bears tubercles and long hairs. The relation between carpus, merus and ischium is like that in the large leg. In young males the second legs are not so strongly unequal: in a specimen of 18 mm the two legs do not differ in shape, though one is slightly stronger and longer than the other. The fingers measure $^3/_4$ of the length of the palm, their cutting edges bear 3 or 4 proximal teeth. The palm is slender. The carpus is somewhat shorter than the palm, the relation between carpus, merus and ischium is as in the adult male. All joints are smooth, being only provided with hairs. In the only ovigerous female at my disposal in which both second legs are present, these legs differ slightly in shape and size. In the more robust leg the fingers are distinctly shorter than the palm, in the other leg they have the same length as the palm. In the larger leg the chela is broader than in the smaller. In both some three or four teeth are present on the cutting edge of the fingers, while the fingers close over their whole length. The third leg reaches with the dactylus beyond the scaphocerite. The propodus is 2.5 to 3 times as long as the dactylus, twice or slightly less than twice as long as the carpus and as long as or slightly shorter than the merus. The ischium is about half as long as the merus. The fifth leg just reaches the end of the scaphocerite, it is somewhat more slender than the third leg; the

propodus is fully thrice as long as the dactylus, somewhat less than twice as long as the carpus and slightly longer than the merus.

The pleopods and uropods are normal in shape.

The eggs are 0.5 to 0.7 mm in diameter.

The specimen from Ceram identified by J. R o u x (1923) as *Palaemon bariensis* certainly does not belong to the present species. As the specimen, a large male, lacks one of the second legs it is not possible to identify it with certainty, in my opinion, however, it is most probable that it belongs to a new species. Its rostrum is straight, rather high and reaches almost to the end of the scaphocerite. The upper margin bears 11 teeth, 4 of which are placed behind the orbit, the fifth is situated just over the orbit. The first tooth is placed slightly before the middle of the carapace. The lower margin of the rostrum bears two teeth. The carapace is scabrous in the anterolateral part. The hepatic spine is somewhat smaller than the antennal and lies behind and somewhat below it.

The abdomen and telson are normal in shape, showing no difference with the typical *M. bariense*. The telson, however, bears only one pair of dorsal spines, which is placed in the middle of the telson. The absence of the posterior pair of dorsal spinules, in all probability is an abnormality.

The eyes are well developed, they are normal in shape. Antennulae normal.

The scaphocerite is about 2.5 times as long as broad. The outer margin is slightly convex. The final tooth is strong, it reaches to or slightly beyond the end of the lamella. The antero-internal angle of the scaphocerite is somewhat produced.

The oral parts are normal.

The first legs reach with the chela and a very small part of the carpus beyond the scaphocerite. The fingers are about as long as the palm. The chela is slightly more than half as long as the carpus. The merus is $^3/_4$ as long as the carpus, while the ischium is about half as long as the merus. The left second leg reaches with the chela beyond the scaphocerite. The fingers are as long as the palm. The cutting edge of both fingers is provided with three small proximal teeth, which are placed close together and about 10 somewhat larger teeth, which are divided over the rest of the cutting edge. The palm is not broadened, it is broadly rounded (not strongly compressed) ventrally, with velvety hairs on the outer and lower surface. This pubescent area does not reach to the articulation with the dactylus. Small tubercles are present on the palm and the bases of the fingers. The carpus is about as broad as the palm and is slightly more than half as long as that joint. The merus is $^4/_3$ as long as the carpus. The ischium is about half as long as the merus. The third leg reaches with part of the dactylus beyond the scaphocerite. The propodus is 2.5 times as long as the dactylus, it is somewhat less than twice as long as the carpus and somewhat shorter than the merus. The fifth legs are missing in my specimen.

The pleopods and uropods are normal.

The present specimen differs from *M. bariense* in the shape and pubescence of the chelae of the second legs and by the shape of the rostrum. It shows most affinity to *M. jacobsoni*; more material, however, is needed to ascertain the real identity of the species, which may be new.

The specimens from Berit (= Bari) are the types of the species, those from Pajeti are mentioned by J. R o u x (1928), those from Waigeo by J. R o u x (1923).

Distribution. *Macrobrachium bariense* lives in fresh water and up till now is only known from the eastern part of the Malay Archipelago. The records in literature are: Kambera River and Pajeti, Sumba (J. R o u x, 1928a), Berit, W. Flores (D e M a n, 1892), Kema, N. Celebes (S c h e n k e l, 1902), Waiho River, Waigeo (J. R o u x, 1923), between Erersin and Ngarangarin, Trangan Island, Aru Islands (J. R o u x, 1919).

Macrobrachium latidactylus (Thallwitz) (fig. 50)

Palaemon grandimanus Von Martens, 1868, Arch. Naturgesch., vol. 34 pt. 1, p. 45 (non Randall, 1837).
Palaemon latidactylus Thallwitz, 1891, Zool. Anz., vol. 14, p. 97.
Palaemon latidactylus Thallwitz, 1892, Abh. zool.-anthrop. Mus. Dresden, 1890-91 pt. 3, p. 17, pl. 1 fig. 3.
Palaemon (*Eupalaemon*) *endehensis* De Man, 1892, Weber's Zool. Ergebn., vol. 2, p. 465, pl. 27 fig. 42.
Palaemon (*Macrobrachium*) *lampropus* De Man, 1892, Weber's Zool. Ergebn., vol. 2, p. 493, pl. 29 fig. 49.
Palaemon (*Macrobrachium*) *latidactylus* De Man, 1892, Weber's Zool. Ergebn., vol. 2, p. 501, pl. 29 fig. 52.
Palaemon lampropus Lanchester, 1901, Proc. zool. Soc. Lond., 1901 pt. 2, p. 568.
Palaemon (*Macrobrachium*) *latidactylus* De Man, 1902, Abh. Senckenb. naturf. Ges., vol. 25, p. 802.
?*Palaemon* (*Macrobrachium*) sp. De Man, 1902, Abh. Senckenb. naturf. Ges., vol. 25, p. 805.
Palaemon lampropus Schenkel, 1902, Verh. naturf. Ges. Basel, vol. 13, p. 511.
Palaemon latidactylus Cowles, 1914, Philipp. Journ. Sci., vol. 9 sect. D, p. 392, pl. 3 fig. 10.
Palaemon lampropus Kemp, 1918a, Mem. Asiat. Soc. Bengal, vol. 6, p. 267.
Palaemon(*Macrobrachium*) *latidactylus* J. Roux, 1919, Abh. Senckenb. naturf. Ges., vol. 35, p. 337.
Palaemon (*Macrobrachium*) *lampropus* J. Roux, 1919, Abh. Senckenb. naturf. Ges., vol. 35, p. 340.
Palaemon (*Macrobrachium*) *lampropus* J. Roux, 1923, Capita Zool., vol. 2 pt. 2, p. 9.
Palaemon (*Macrobrachium*) *latidactylus* J. Roux, 1928a, Treubia, vol. 10, p. 220.
Palaemon (*Parapalaemon*) *scabriculus* J. Roux, 1930, Rev. Suisse Zool., vol. 37, p. 361.
Palaemon (*Macrobrachium*) *latidactylus* J. Roux, 1933, Rés. sci. Voy. Pr. Belg. Ind. or., vol. 3 pt. 14, p. 8.
Palaemon latidactylus Estampador, 1937, Philipp. Journ. Sci., vol. 62, p. 488.
Palaemon grandimanus Estampador, 1937, Philipp. Journ. Sci., vol. 62, p. 489.
Macrobrachium lampropus Suvatti, 1937, Check List aq. Fauna Siam, p. 49.

Siboga Expedition

Station 4, Anchorage off Djangkar (E. Java), 7° 42′ S, 114° 12′.6 E; shore; depth 9 m; bottom coarse sand; March 9, 1899. — 1 ovigerous female 51 mm.
River near Station 19, Bay of Labuhan Tereng, westcoast of Lombok, 8° 44′.5 S, 116° 2′.5 E; March 19-21, 1899. — 34 specimens (included ovigerous females) 13-67 mm (one specimen bopyrized).
Station 33, River near Pidjot, Lombok; March 25, 1899. — 2 specimens 59 & 63 mm.
River near Station 53, Bay of Nangamesi, Sumba; April 21 and 22, 1899. — 2 specimens 25 & 27 mm.
Station 58, Anchorage off Seba, Sawu Island; dredge and shore exploration; depth up to 27 m; bottom sand; April 25, 1899. — 6 specimens (included ovigerous females) 14-80 mm.
River near Station 114, Kuandang Bay, N. Celebes, 0° 58′.5 N, 122° 55′ E; July 8, 1899. — 5 specimens 28-40 mm.

Snellius Expedition

Rivulet near Menado; 0-1 m; August 28, 1929. — 9 specimens (included ovigerous females) 15-34 mm.
Kupang, Timor; fresh water; November 17, 1929. — 6 specimens 30-59 mm.
Beo, Talaud Islands; fresh water; June 14-21, 1930. — 2 specimens (included 1 ovigerous female) 54 and 58 mm.

Museum Leiden

Ba River, near Ende, Flores; 1888-1889; leg. M. Weber; cotype of *Palaemon endehensis* De Man. — 1 specimen 39 mm.

Bantimurong near Maros, Celebes; 1888-1889; leg. M. Weber; cotypes of *Palaemon lampropus* De Man. — 3 specimens 29-44 mm.
Air Lorike, Hitu Peninsula, Amboina; March 17, 1923; leg. F. Kopstein. — 1 specimen 32 mm.

Museum Amsterdam

Pajeti, Sumba; July, 1924; leg. J. Lambooy. — 6 specimens 27-63 mm.
Rivers near Berit (= Bari) and Reo, Flores; 1888-1889; leg. M. Weber; cotypes of *Palaemon endehensis* De Man. — 16 specimens 17-44 mm.
River near Berit (= Bari), W. Flores; 1888-1889; leg. M. Weber. — 4 specimens 16-45 mm.
Raka-mbaha (= Mbawa), S. Flores; near the sea; 1888-1889; leg. M. Weber; cotypes of *Palaemon endehensis* De Man. — 3 specimens 32 and 37 mm.
Raka-mbaha, S. Flores; near the sea; 1888-1889; leg. M. Weber. — 1 specimen 28 mm.
Ba River, near Ende, Flores; 1888-1889; leg. M. Weber; cotypes of *Palaemon endehensis* De Man. — 12 specimens (included ovigerous females) 21-47 mm.
Ba River, near Ende, Flores; 1888-1889; leg. M. Weber. — 1 specimen 43 mm.
Nargi River near Konga, E. Flores; 1888-1889; leg. M. Weber; cotypes of *Palaemon endehensis* De Man. — 2 specimens (one ovigerous female) 40 & 45 mm.
Koinino River, near Kupang, Timor; 1888-1889; leg. A. Wichmann; cotypes of *Palaemon lampropus* De Man. — 2 specimens 30 & 41 mm.
River near Palopo, Luwu, Central Celebes; 1888-1889; leg. M. Weber; cotypes of *Palaemon lampropus* De Man. — 10 specimens (included one ovigerous female) 35-68 mm.
River near Parepare, S. W. Celebes; 1888-1889; leg. M. Weber; cotypes of *Palaemon lampropus* De Man. — 4 specimens 16-42 mm.
Bantimurong near Maros, S. W. Celebes; 1888-1889; leg. M. Weber; cotypes of *Palaemon lampropus* De Man. — 13 specimens 31-51 mm.
River near Mumes, Waigeo; December 29, 1909; leg. L. F. de Beaufort. — 1 ovigerous female 40 mm.
Waiho River, Waigeo; fresh water, collected upstreams of some rapids; December 20, 1909; leg. L. F. de Beaufort. — 10 specimens 31-36 mm.
Rabiai River, Waigeo; December 31, 1910; leg. L. F. de Beaufort. — 3 specimens 38-54 mm.

The present species is extensively described by De Man (1892) and Cowles (1914), while Roux (1919) also gave some interesting details. The following remarks may be added:

The rostrum is straight or directed slightly downwards, sometimes the extreme tip is slightly curved upwards, it reaches about to the end of the antennular peduncle. The upper margin bears 13 to 18 teeth (generally 15 or 16), 3 to 5 of which (generally 4) are placed on the carapace behind the orbit. The distance between the first tooth and the posterior limit of the orbit varies between $^1/_2$ and $^1/_3$ (in large male specimens even to $^1/_4$) of the length of the carapace, measured from its posterior margin to the posterior margin of the orbit. In larger males that distance generally is smaller than in younger specimens or females. At first I thought the character of the length of the distance beween the first dorsal rostral tooth and the posterior limit of the orbit to be of value to separate *M. latidactylus* from *M. endehense*. In the type material of *M. endehense* that distance namely varies between $^1/_2$ to $^1/_{2.7}$ of the length of the carapace, being generally more than $^1/_{2.5}$ of that length. In larger specimens of *M. latidactylus* this relation generally was $^1/_3$. Other material, however, showed the variability of this character, so in the material of Siboga Sta. 58, the adult male has this distance $^1/_4$, the two ovigerous females $^1/_{2.7}$ and $^1/_{2.5}$ of the length of the carapace. The lower margin of the rostrum bears 2 to 5 teeth (generally 3 or 4). The carapace in adult specimens is roughened in the anterior and lower portions by minute spinules.

The fifth abdominal segment has the pleurae ending in an acute angle. The sixth segment is only slightly longer than the fifth.

The telson is somewhat less than 1.5 times the length of the sixth abdominal segment. The anterior pair of dorsal spines is placed in the middle of the telson, or slightly behind it. The second pair is situated midway between the anterior pair and the posterior margin of the telson. This posterior margin ends in a median point, which is distinctly overreached by the inner pair of spines, between which about three pairs of feathered setae are present. The outer pair of spines is very short.

The eyes have the cornea very broad, being about as long as and distinctly broader than the stalk. An ocellus is present.

The scaphocerite (fig. 50a) has the outer margin about straight, the final tooth just fails to reach the end of the lamella, which is broadest slightly above the base and gradually narrows towards the apex.

The oral parts are quite typical.

The first pereiopods are slender, in the adult male they reach with the chela and part of the carpus beyond the scaphocerite, while in the ovigerous females and younger males only the larger part of the chela overreaches that scale. In adult males the carpus is twice as long as the chela, in females and young males it is relatively shorter. The merus measures $^4/_5$ of the length of the carpus. The second legs of the adult males have been extensively described by De Man (1892) and Cowles (1914). The variation shown in the shape of the large chela of the adult male in Cowles's and De Man's material may also be observed in my specimens. The palm of some specimens is considerably higher than in others, sometimes it is strongly narrowed posteriorly, sometimes the fingers are much shorter, sometimes they are as long as the palm, the fixed finger may be very high at its base, but sometimes it is more slender there. These differences are individual variations and are connected by many transitions, so that they have no specific value at all. Also the smaller second leg of the adult male has the relation between the length of the fingers and that of the palm very variable, generally, however, the fingers are much longer than the palm. The form described by De Man (1892) as a new species under the name *Palaemon lampropus,* belongs to the present species. The "adult" male of De Man's *Palaemon lampropus* is a male of *Macrobrachium latidactylus,* in which the second pereiopods have not yet attained their final development ("mâle féminisé" of Coutière, 1901), this at once becomes clear, when we compare the various male cotypes of *P. lampropus* with the other material at hand: all transitions of the typical *lampropus* leg (fig. 50e) and the typical *latidactylus* leg are present. Fig. 50g represents the larger leg of a male cotype of *P. lampropus,* which shows already the strongly curved dactylus, while fig. 50 f represents the chela of a young *latidactylus* specimen in which the leg still more resembles the typical *latidactylus* type. Cowles figured such transitional chelae too (cf. his fig. 10c). Like in the adult males, the chelae of the "mâles feminisés" too are very variable in shape: generally the fingers are distinctly shorter than the palm (fig. 50e). In a specimen from the river Ba, Flores, described by De Man (1892) as *Palaemon* (*Macrobrachium*) *latidactylus* var., the fingers are as long as the palm (fig. 50d), while in a specimen of 40 mm from the river near Siboga Sta. 114 the fingers are distinctly longer than the palm (fig. 50c), in the same locality, however, a male with the typical *"lampropus"* chela was collected. I have too little material at my disposal to make a final conclusion whether the form with the long fingers really is varietally distinct or not, but I think it rather improbable, the more as the large chela of the adult male too shows such a large variability. The smaller chelae which in

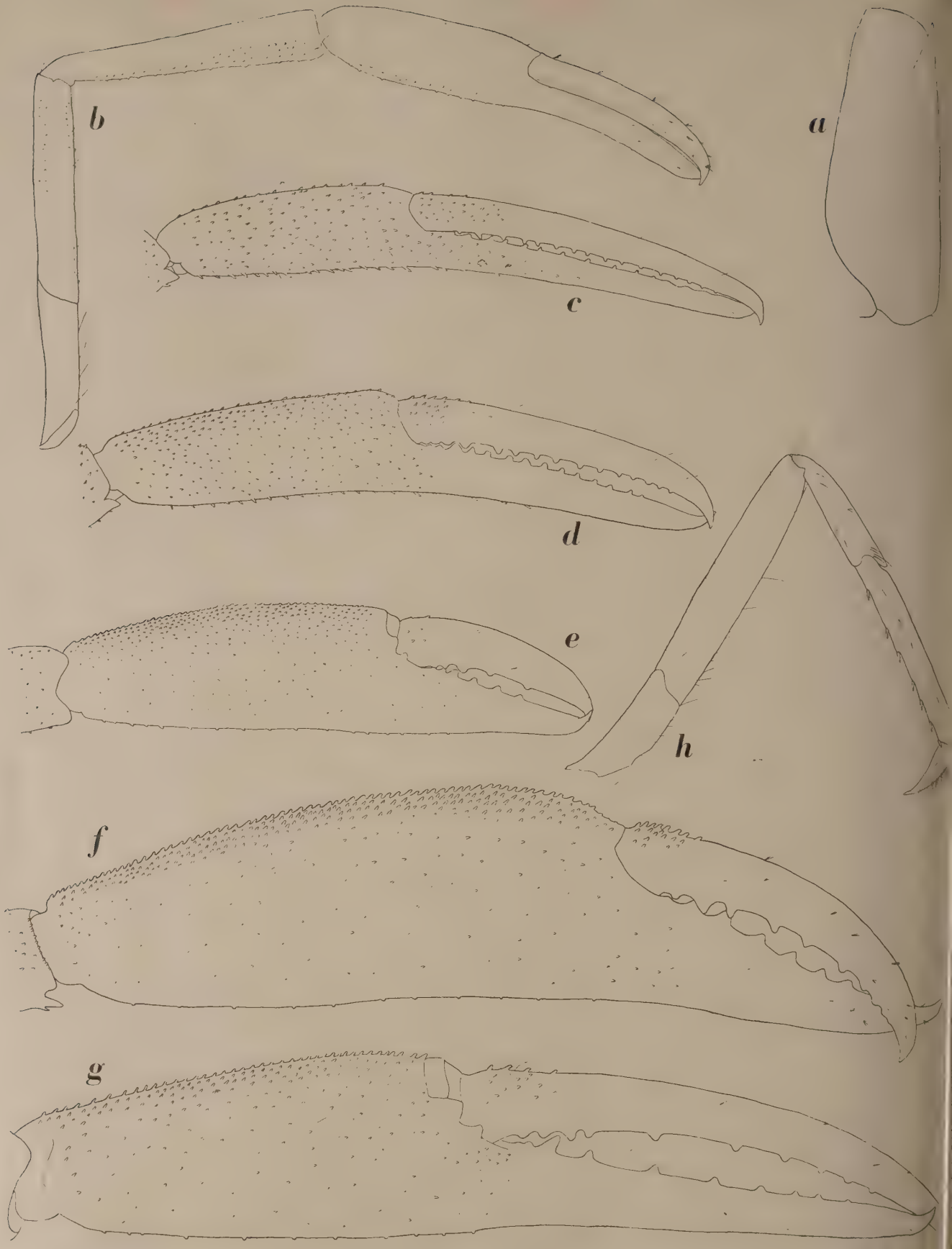

Fig. 50. *Macrobrachium latidactylus* (Thallwitz). a, scaphocerite; b. second pereiopod of female; c, d, e, f, g, chelae of second legs of males (c, from Siboga Sta 114; d, from Ba River, Flores; e, from Bantimurong, Celebes, cotype of *Palaemon lampropus* De Man; f, from Siboga Sta. 19; g, from Bantimurong, Celebes, cotype of *Palaemon lampropus* De Man, ex. coll. Mus. Leiden); h, third leg. a-h, × 6.

the "mâle féminisé" has the fingers closed, gradually gets its final shape with the gaping fingers, which are provided at their inner margins with stiff inwards directed hairs. Also *Palaemon endehensis* De Man can not be separated from the present species. De Man, while placing *P. latidactylus* in the subgenus *Macrobrachium,* brings *P. endehensis* in the subgenus *Eupalaemon.* These two subgenera should differ by the fact that the palm of the second chela is cylindrical in *Eupalaemon* and compressed in *Macrobrachium.* This difference, as pointed out by later authors (e.g. Henderson & Matthai, 1910) is of no value, since the palm in young specimens of all species of the present genus is cylindrical and in some forms may become compressed, while many transitions exist. When comparing the type material of *P. endehensis* with my material of *Macrobrachium latidactylus* the only difference I could find was shown by the second legs of the large male type of *P. endehensis.* The difference of the dentition of the rostrum, which I first thought to be of specific value, proved to be worthless (vid. p. 240). The chela of the large second leg of the larger male type of *P. endehensis* very much resembles the chelae of the "mâles féminisés" of *M. latidactylus*; the smaller second leg, however, shows the same shape as that of the adult males of *M. latidactylus.* It is therefore very probable that *P. endehensis* is based on a specimen of *Macrobrachium latidactylus* which is a full grown male, in which the larger second leg for some reason or other has not (yet) reached its final stage of development. Also the fact that the types of *P. endehensis* have been found together with *Macrobrachium latidactylus* in the same localities is a point in favour of the supposition that the two forms are identical. In the females and young males of my *"latidactylus", "lampropus"* and *"endehensis"* material not the least difference could be observed. The larger (ovigerous) females have the second pereiopods (fig. 50b) equal in shape and size. The legs reach with a small part of the carpus beyond the scaphocerite. The fingers are slender and close over their entire length. They are slightly shorter than or as long as the palm and often are directed obliquely downwards in relation to the palm. The cutting edge of the dactylus shows three, that of the fixed finger 2 small teeth in the proximal portion, the rest of the margin is entire. The palm is only slightly compressed. The carpus is somewhat longer than the palm and is about $^2/_3$ as long as the chela. The merus is shorter than the carpus. The ischium is distinctly shorter than the merus. All joints are provided with numerous small spinules, which are placed in more or less distinct longitudinal rows. The last three pairs of pereiopods are similarly built. The third (fig. 50h) reaches with a part of the dactylus only beyond the scaphocerite. The propodus is 2.5 times as long as the dactylus (in old specimens the dactylus seems to be shorter, as its apex has been worn off). There is a distinct row of spines present along the posterior margin of the propodus. The carpus is somewhat more than half as long as the propodus. The merus is longer than the propodus. The fifth pereiopod distinctly fails to reach the end of the scaphocerite. The propodus is about thrice as long as the dactylus and is, apart from the posterior spines, provided with the usual transverse rows of hairs in the distal part of the posterior margin. The carpus is about half as long as the propodus and the merus is slightly shorter than the propodus. All joints of the last three pereiopods are provided with scattered stiff and long hairs. The merus of the third leg (sometimes also that of the fourth) in the adult male moreover bears along its posterior margin similar spinules as are present in the second legs.

The endopod of the first pleopod of the male is rather slender, it further is of the typical shape: oval with a concave inner margin. The other pleopods too are normal in shape, just like the uropods.

The very young specimens show most resemblance to the females, they only have the legs shorter and without spinules.

The specimen from Manila described by Von Martens under the name *Palaemon grandimanus* Randall, does not belong to that species, but to *Macrobrachium latidactylus,* as already has been showed by Thallwitz (1892), De Man (1892) and Cowles (1914). The record of Estampador (1937) of *Palaemon grandimanus* from the Philippines is based on that of Von Martens.

As has already been pointed out above *Palaemon lampropus* and *P. endehensis* of De Man can not be separated from the present species. The differences in the armature of the rostrum between *P. latidactylus* and *P. lampropus* as they have been given by De Man do not exist, because in typical specimens of *M. latidactylus* the number of dorsal teeth varies between 13 and 18 (a number also found by Roux, 1919, p. 338).

The specimens from Lombok described by J. Roux (1930) as *Palaemon* (*Parapalaemon*) *scabriculus,* in all probability belong here, as J. Roux's description much better fits for *M. latidactylus* than for *M. scabriculus.* It is difficult, however, to make a final statement without examination of the specimens, as these both are females. The fact that *M. latidactylus* is rather common at Lombok, while *M. scabriculum* is not known from that locality also supports my supposition.

The specimens of the Leiden and Amsterdam Museums from Flores, Timor and Celebes have already been described by De Man (1892); part of this material served De Man for the original descriptions of his new species *Palaemon endehensis* and *P. lampropus.* The specimens from Waigeo collected by De Beaufort (Mus. Amsterdam) were mentioned by J. Roux (1923) those from Sumba (Mus. Amsterdam) by the same author (J. Roux, 1928a).

Distribution: The species lives in fresh water, though the records from Sta. 4 and Sta. 58 of the Siboga Expedition point to the possibility, that it sometimes occurs in sea. *Macrobrachium latidactylus* is only known from Malaysia. The records in literature are: Aring, Kelantan (Lanchester, 1901), Patani River, Siamese Malay States (Kemp, 1918a), Klong Nakorn Noi and Ban Kiri Wong, Nakorn Sritamarat State, Siamese Malay States (Suvatti, 1937), Mariveles, Bataan Province, Luzon, Philippines (Estampador, 1937), neighbourhood of Manila, Luzon. Philippines (Cowles, 1914), Province Camarines Sur, Southern Luzon, Philippines (Von Martens, 1868), Samar, Philippines (Cowles, 1914), Gandara, Samar (Estampador, 1937), Borongan, Samar, Philippines (Von Martens, 1868), Jaro, Leyte, Philippines (Cowles, 1914; Estampador, 1937), Agusan River, Mindanao, Philippines (Cowles, 1914; Estampador, 1937), North Celebes (Thallwitz, 1891, 1892), between Borau and Menangalu, Luwu, Central Celebes (Schenkel, 1902), Palopo, Luwu, Central Celebes (De Man, 1892), Parepare, S.W. Celebes (De Man, 1892), Bantimurong near Maros, S.W. Celebes (De Man, 1892), Lombok (J. Roux, 1930), Ba River, Flores (De Man, 1892), Berit, Reo, Raka-mbaha and Konga, Flores (De Man, 1892), Pajeti and Mao Marru, Sumba (J. Roux, 1928a), Koinino River near Kupang, Timor (De Man, 1892), Kau, Halmahera (De Man, 1902), Mumes, Waiho and Rabiai Rivers, Waigeo Island, off N.W. New Guinea (J. Roux, 1923), Enralang, Groot Kai, Kai Islands (J. Roux, 1919), Sungai Manumbai, Aru Islands (J. Roux, 1933), Panuabori, Matora and Waskai rivers along Sungai Manumbai, Wokam, Aru Islands (J. Roux, 1919), Seltutti, Kobroor, Aru Islands (J. Roux, 1919).

Macrobrachium lepidactylus (Hilgendorf)

Palaemon (*s.s.*) *lepidactylus* Hilgendorf, 1879, Mber. Akad. Wiss. Berlin, 1878, p. 838, pl. 4 figs 14-16.

non *Palaemon lepidactylus* Miers, 1880, Ann. Mag. nat. Hist., ser. 5 vol. 5, p. 384.
Palaemon lepidodactylus p.p.? Pfeffer, 1889, Jb. Hamb. wiss. Anst., vol. 6 pt. 2, p. 34.
Palaemon lepidactylus Ortmann, 1891, Zool. Jb. Syst., vol. 5, p. 735.
Palaemon (*Macrobrachium*) *lepidactylus* Hilgendorf, 1898, Deutsch O. Afrika, vol. 4 pt. 7, p. 32, fig. B.
Palaemon (*Macrobrachium*) *Hilgendorfi* Coutière, 1899, Bull. Mus. Hist. nat. Paris, vol. 5, p. 382.
Palaemon (*Macrobrachium*) *lepidactylus* Coutière, 1900, C. R. Acad. Sci. Paris, vol. 130, p. 1267.
Palaemon (*Macrobrachium*) *Hilgendorfi* Coutière, 1900, C. R. Acad. Sci. Paris, vol. 130, p. 1267.
Palaemon (*Macrobrachium*) *lepidactylus* Coutière, 1901, Ann. Sci. nat. Zool., ser. 8 vol. 12, p. 272, pls. 10, 11 fig. 13.
Palaemon (*Macrobrachium*) *Hilgendorfi* Coutière, 1901, Ann. Sci. nat. Zool., ser. 8 vol. 12, p. 281, pl. 11 figs. 14-17.
Macroterocheir lepidactylus Stebbing, 1908, Ann. S. Afr. Mus., vol. 6, p. 40.
Macroterocheir lepidactylus Stebbing, 1910, Ann. S. Afr. Mus., vol. 6, p. 386.
Palaemon (*Macrobrachium*) *lepidactylus* Calman, 1913, Proc. zool. Soc. Lond., 1913, p. 926.
non *Palaemon lepidactylus* Cowles, 1914, Philipp. Journ. Sci., vol. 9 sect. D, p. 389, pl. 3 fig. 9.
Palaemon (*Macrobrachium*) *lepidactylus* J. Roux, 1934, Faune Colon. Franç., vol. 5, p. 541.
non *Palaemon lepidactylus* Estampador, 1937, Philipp. Journ. Sci., vol. 62, p. 488.

Macrobrachium lepidactylus is very closely related to the next species. By some authors the two forms are considered to be identical. My reasons for their separation as two distinct species will be given below under *M. hirtimanus*.

Palaemon Hilgendorfi can not be considered a distinct species, as is already pointed out by Calman (1913) and J. Roux (1934).

The specimens named by Miers (1880), Cowles (1915) and Estampador (1937) *Palaemon lepidactylus* do not belong here, but are *Macrobrachium hirtimanus* (vid. there).

According to Hilgendorf (1898) the specimens mentioned by Pfeffer (1889) under the name *Palaemon lepidodactylus*, at least those from Zanzibar, belong to *Macrobrachium lar*.

Distribution: The species inhabits fresh water of E. and S.E. Africa and Madagascar. The records in literature are: Korogwe, N. Tanganyika (Pfeffer, 1889; Hilgendorf, 1898), Zanzibar (Coutière, 1901), Uzaramo, S. Tanganyika (Pfeffer, 1889; Hilgendorf, 1898), Quelimane and Tete, Mozambique (Hilgendorf, 1879, 1898), Barberton, Transvaal (Stebbing, 1910), Umgeni lagoon near Durban, Natal (Stebbing, 1908, 1910), Madagascar (Coutière, 1900, 1901), Ambatonharanana, Mangoro Terrace, N.W. of Tamatave (Calman, 1913), Ifotry, near Tamatave, E. Madagascar (Calman, 1913), Bétampona, Tamatave Region (J. Roux, 1934), Betsileo, Central Madagascar (Calman, 1913), Onilahy River near Tulear, S.W. Madagascar (J. Roux, 1934).

Macrobrachium hirtimanus (Olivier) (fig. 51a)

Palaemon hirtimanus Olivier, 1811, Enc. méth. Hist. nat., vol. 8, p. 663.
Palaemon hirtimanus Lamarck, 1818, Hist. nat. Anim. s. Vert., ed. 1 vol. 5, p. 207.
Palaemon hirtimanus Latreille, 1818, Tabl. enc. méth., vol. 24, p. 5, pl. 318 fig. 2.
Palemon hirtimanus H. Milne Edwards, 1837, Hist. nat. Crust., vol. 2, p. 400.
Palaemon hirtimanus H. Milne Edwards, 1838, Lamarck's Hist. nat. Anim. s. Vert., ed. 2 vol. 5, p. 367.
Palaemon hirtimanus White, 1847, List Crust. Brit. Mus., p. 79.
Palemon hirtimanus De Haan, 1849, Fauna Japonica Crust., atlas, pl. P.
Palaemon hirtimanus A. Milne Edwards, 1862, Maillard's Notes Ile Réunion, Ann. F, p. 16.

Palaemon hirtimanus Von Martens, 1876, Preuss. Exped. Ost-Asien, Zool., vol. 1, p. 315.
Palaemon hirtimanus Miers, 1879, Philos. Trans. Roy. Soc. Lond., vol. 168, p. 493.
Palaemon lepidactylus Miers, 1880, Ann. Mag. nat. Hist., ser. 5 vol. 5, p. 384.
Palaemon hirtimanus Ortmann, 1891, Zool. Jb. Syst., vol. 5, p. 737, pl. 47 fig. 10.
Palaemon hirtimanus De Man, 1892, Weber's Zool. Ergebn., vol. 2, p. 486.
Palaemon (*Macrobrachium?*) sp. De Man, 1892, Weber's Zool. Ergebn., vol. 2, p. 488, pl. 28 fig. 47.
Palaemon (*Macrobrachium*) *placidulus* p.p. De Man, 1892, Weber's Zool. Ergebn., vol. 2, p. 489.
Palaemon (*Macrobrachium*) *lepidactyloides* De Man, 1892, Weber's Zool. Ergebn., vol. 2, p. 497, pl. 29 fig. 51.
Palaemon (*Macrobrachium*) *placidulus* p.p. De Man, 1893, Notes Leyden Mus., vol. 15, p. 305.
Palaemon (*Macrobrachium*) *lepidactyloides* De Man, 1893, Notes Leyden Mus., vol. 15, p. 308, pl. 7 fig. 8.
Palaemon hirtimanus Sharp, 1893, Proc. Acad. nat. Sci. Philad., 1893, p. 122.
Palaemon lepidactyloides Schenkel, 1902, Verh. naturf. Ges. Basel, vol. 13, p. 514.
Palaemon lepidactylus Cowles, 1915, Philipp. Journ. Sci., vol. 9 sect. D, p. 389, pl. 3 fig. 9.
Palaemon (*Macrobrachium*) *lepidactylus lepidactyloides* p.p. J. Roux, 1923, Capita Zool., vol. 2 pt. 2, p. 11.
Palaemon (*Macrobrachium*) *lepidactylus lepidactyloides* J. Roux, 1928a, Treubia, vol. 10, p. 220.
Palaemon (*Macrobrachium*) *hirtimanus* J. Roux, 1934, Faune Colon. Franç., vol. 5, p. 543.
Palaemon lepidactylus Estampador, 1937, Philipp. Journ. Sci., vol. 62, p. 488.
Palaemon hirtimanus Ward, 1942, Mauritius Inst. Bull., vol. 2, p. 57.

Siboga Expedition

Station 33, River near Pidjot, Lombok; March 25, 1899. — 1 loose large chela of adult male and 1 ovigerous female 61 mm.

Museum Leiden

Sumba; leg. P. J. Lambooy. — 1 ovigerous female 51 mm.
Maumere, northcoast of E. Flores; 1891; leg. H. ten Kate. — 5 specimens (4 ovigerous females) 39-59 mm.
Besar Island (= Groot Bastaard), off N.E. Flores; 1891; leg. H. ten Kate. — 1 specimen 76 mm.
N. New Guinea; April 5, 1911; leg. K. Gjellerup; New Guinea Expedition 1910-1911. — 1 specimen 58 mm.
Indian Archipelago. — 2 specimens 79 and 85 mm.
Fiji Islands; 1887; Museum Godeffroy. — 1 specimen 66 mm.
Pacific Ocean; Museum Godeffroy. — 1 specimen 81 mm.

Museum Amsterdam

Lolowau, Nias; W. of Sumatra; leg. J. P. Kleiweg de Zwaan. — 27 specimens 33-74 mm.
Nias; leg. J. P. Kleiweg de Zwaan. — 7 specimens (1 ovigerous female) 31-48 mm.
Raka-mbaha (= Mbawa), W. Flores; in river upstreams of a waterfall; 1888-1889; leg. M. Weber; type of *Palaemon lepidactyloides* De Man. — 1 specimen 45 mm.
Ndona River, near Ende, S. Flores; 1888-1889; leg. M. Weber; cotypes of *Palaemon placidulus* De Man. — 2 specimens 30-34 mm.
Lela River, near Sikka, Flores; 1888-1889; leg. M. Weber; cotypes of *Palaemon placidulus* De Man. — 2 ovigerous females 43 and 44 mm.
River near Palopo, Luwu, Central Celebes; fresh water; 1888-1889; leg. M. Weber. — 1 ovigerous female 46 mm.
Batjan, N. Moluccas; December 11, 1909; leg. L. F. de Beaufort. — 2 specimens 24 and 26 mm.
Tuba River, W. Ceram, Moluccas; February, 1910; leg. L. F. de Beaufort. — 3 specimens 41-47 mm

Rivulet near Honitetu, W. Ceram; February 22, 1910; leg. L. F. de Beaufort. — 1 specimen 57 mm.
Upper Riuapa River, W. Ceram; February 22, 1910; leg. L. F. de Beaufort. — 4 specimens (1 ovigerous female) 24-87 mm.

The rostrum is about straight, above the eyes it mostly is slightly convex, but the tip is directed straight forwards. The rostrum is very narrow and is of about equal width throughout its length. It reaches generally to the end of the second segment of the antennular peduncle, sometimes it reaches to the middle of the third segment, but never overreaches the antennular peduncle. The upper margin bears 10 to 13 teeth in my material, 5 to 7 (generally 6) of these teeth are placed behind the posterior limit of the orbit. The teeth are divided regularly over the upper margin of the rostrum, though the first three or four stand somewhat wider apart than the others; all teeth are short and small. The first tooth is placed somewhat before the middle of the carapace, the distance between this tooth and the posterior margin of the orbit is 0.39 to 0.48 of the length of the entire carapace (in *M. lepidactylus* this distance is 0.23 to 0.32 of the length of the entire carapace). The lower margin bears 2 (seldom 3) teeth. The carapace is smooth, even in adult males. The hepatic spine is somewhat smaller than the antennal and is placed behind and below it, not lying in one line with it.

The abdomen is smooth in all stages. The first three pleurae are broadly rounded. Those of the fourth and fifth segment are more triangular; that of the fifth segment ends in a more or less acute point. The sixth segment is only slightly longer than the fifth.

The telson is almost 1.5 times as long as the sixth abdominal segment. Of the two pairs of dorsal spines, the anterior is situated in or somewhat behind the middle of the telson, the posterior pair about halfway between the anterior pair and the posterior margin of the telson. The apex ends in a sharp point, which is generally worn off in adult specimens, which thereby have the end of the telson truncated. In young specimens the apex of the telson is horny and transparant. The inner pair of spines of the posterior margin distinctly overreaches the end of the telson, the outer pair is short. Numerous setae are present between the inner spines.

The eyes and the antennulae are normal in shape.

The scaphocerite is about 2.5 times as long as broad. The outer margin is slightly concave, the lamella overreaches the final tooth and is angular antero-internally.

The oral parts are typical.

The first pereiopod (fig. 51a) reaches with about half the carpus beyond the scaphocerite. The fingers are as long as the palm. The carpus is somewhat less than twice as long as the chela. The merus measures $^4/_5$ of the length of the carpus. The ischium is about half as long as the merus. The second pereiopods of the full grown male are very unequal. The larger leg in the adult male is larger than the whole body, it reaches with part of the merus beyond the scaphocerite. The fingers are slender and generally longer than the palm. In the proximal part the fingers bear some large teeth: the dactylus bears 2 or 3 such teeth, one close near the base, one in the middle and sometimes one between these two teeth; between the most distal of the large teeth and the apex of the dactylus a double row of about 12 small, sharp, anteriorly directed teeth is present. The fixed finger possesses only two large teeth, one at the base of the finger, the other at about $^3/_4$ of its length; between these teeth the cutting edge is distinctly concave; a similar double row of about 6 to 12 teeth as on the dactylus is present between the distal large tooth and the apex of the fixed finger. In the specimen from Besar Island (Museum Leiden) only the basal large teeth are present, the other teeth are missing and the double row in the distal part of the cutting edge consists of 20 teeth. The palm generally is much

compressed, but the strength of the compression is very variable. The palm generally is twice or less than twice as long as high. The palm and the entire fingers are closely beset with numerous spinules which are more or less pressed against the surface; in the fingers the spinules are placed so close together, that they partly overlap each other. Along the lower margin the spinules are more erect. The carpus is slightly longer than the merus in adult specimens, in young specimens it sometimes is shorter. Posteriorly the carpus narrows considerably, being about half as broad posteriorly than anteriorly. The merus is somewhat broadened in the middle and is somewhat less than twice as long as the ischium. All joints are covered with numerous similar spinules as are present on the palm. The smaller second leg of the adult male reaches with the chela and carpus beyond the scaphocerite. The fingers are about twice as long as the palm, they gape generally considerably, sometimes, however, the fingers are more straight and leave less space between them. The entire inner surface of the

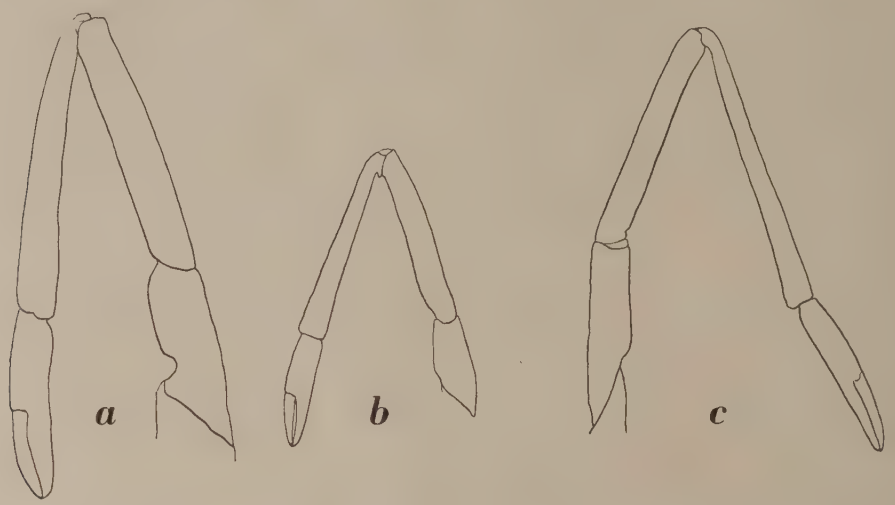

Fig. 51. First pereiopod. a, of *Macrobrachium hirtimanus* (Olivier); b, of *Macrobrachium placidum* (De Man); c, of *Macrobrachium placidulum* (De Man). a-c, × 4.

fingers is closely beset with numerous stiff setae, which are directed inwards, so that nothing of the cutting edge is visible. As far as I can make out no teeth are present on the cutting edge. The palm is short, about as long as broad. The carpus is short and broad, more or less abruptly narrowing towards the base, it is about as long as the merus (it may be slightly longer or slightly shorter). The ischium is $^3/_4$ as long as the merus or longer. All joints are provided with numerous spinules as in the larger leg. In the females and the young male the second legs are more equal in length and in shape. In the young male of 38 mm from W. Ceram already something of the differences in the two legs is visible (vid. table), the palm of the smaller leg already is much shorter than the fingers, the fingers of this leg have already some of the long stiff hairs on their inner surface, while the cutting edges bear some 2 to 4 very small teeth in the proximal portion. In the larger leg already something of the final arrangement of the teeth is visible, here some of the long stiff hairs, which are so characteristic for the smaller leg, are still visible. The measurements (in mm) of the various joints of the second legs in my material are as follows:

material		body length	leg [1]	second legs					
				fingers	palm		carpus	merus	ischium
					length	height			
Siboga Sta.33	♂	?	l	35.0	24.0	17.2	26.0	23.0	14.0
Besar Island	♂	76.0	l	34.0	17.0	14.2	21.0	19.0	10.0
			s	17.0	9.0	7.2	12.0	12.0	8.0
Indian Archipelago	♂	85.0	l	30.0	22.0	16.0	24.0	21.0	12.0
			s	22.0	11.0	9.0	15.0	14.0	9.5
	♂	79.0	l	26.0	23.0	17.0	22.0	19.0	11.0
			s	20.0	10.0	8.0	13.0	12.0	8.0
Fiji Islands	♂	66.0	l	22.0	21.0	14.5	18.0	17.0	9.5
			s	18.0	8.0	6.4	11.0	10.0	7.0
Pacific Ocean	♂	81.0	s	18.0	8.0	5.8	11.0	11.0	8.0
Lolowau, Nias	♂	74.0	l	16.0	14.0	8.0	12.0	11.0	7.0
			s	11.0	6.0	4.0	8.0	8.0	5.0
W. Ceram	♂	87.0	l	16.0	10.0	6.0	12.0	12.0	8.0
			s	14.0	8.0	5.4	10.0	10.0	6.0
	ov. ♀	70.0	—	10.0	9.0	5.0	9.0	9.2	7.0
	♂	38.0	l	5.2	4.2	2.7	4.3	5.2	3.7
			s	4.7	3.0	2.0	4.2	5.0	3.5

1) l = larger leg, s = smaller leg.

The third leg reaches with about 1/3 to 1/2 of the propodus beyond the scaphocerite; it is rather heavily built. The dactylus bears a small lobe at the posterior margin slightly before the apex. The propodus is somewhat more than twice as long as the dactylus. The carpus measures 2/3 of the length of the propodus. The merus is distinctly longer than the propodus. The ischium is about half as long as the merus. The fifth leg reaches to or slightly beyond the scaphocerite. The relations between the joints are as in the third leg, though the fifth is more slender. Of the last three pereiopods of the adult male all joints, even the dactylus, are provided with numerous horny scale-shaped spinules. In large females too traces of these scales are visible. Furthermore there are also the usual spinules along the posterior margin of the propodus, and the transverse rows of hairs in the distal part of the propodus of the fifth leg. These latter rows of hairs are placed close together so as to form a bushy organ at the end of the propodus.

The pleopods and uropods are normal in shape. The uropodal exopod sometimes is slightly longer, sometimes slightly shorter than the endopod.

The eggs are numerous and small, they are 0.45 to 0.6 mm in diameter.

Coutière (1901), came to the conclusion that the separation of the Malay species *Palaemon lepidactyloides* De Man, from the East African *Palaemon lepidactylus* Hilgendorf is not justified. One by one he discusses the 5 characters mentioned by De Man (1892) for separating the two forms. These five characters are:

1. The rostrum of *P. lepidactylus* reaches the end of the antennular peduncle, while in *P. lepidactyloides* it does not overreach the second segment of that peduncle.

2. The first tooth of the rostrum of *P. lepidactylus* is situated in the anterior third of the carapace, in *P. lepidactyloides* it stands on the middle of the carapace.

3. The fingers of the large chela in *P. lepidactylus* are much longer than the palm, in the other

species the fingers and the palm are of about equal length. The fingers of the former bears very feeble teeth, while the teeth of the latter are strong.

4. The spinulation of the two sides of the palm of the large chela are similar in *P. lepidactylus*, different in *P. lepidactyloides*.

5. The exopod of the uropod is larger than the endopod in *P. lepidactylus*, smaller in *P. lepidactyloides*.

Coutière showed that the length of the rostrum in his specimens was variable, that it sometimes overreached the peduncle, but generally did not extend beyond the second segment. In my material too the length of the rostrum is variable, but generally is shorter than that of the Madagascar specimens, as it never reaches beyond $^{3}/_{4}$ of the length of the distal segment of the peduncle. The character, however, is insufficient to be used for separating species. The curvature of the rostrum is variable in both species and it thus can not be used as a specific character, at least many of my specimens show the curvature figured by Coutière. I only should like to remark that in none of my specimens the rostrum is so deep as figured by Coutière (1901, pl. 10 fig. 1); in Hilgendorf's (1878, pl. 4 fig. 15) figure, however, the rostrum is much narrower.

The second point can not be explained by Coutière as in his material from Madagascar the relation between the length of that part of the carapace which bears rostral teeth and the entire length of the carapace (rostrum excluded), varies between $^{1}/_{3.1}$ to $^{1}/_{4.4}$. In all my material from the Malay Archipelago and Oceania this relation varies between $^{1}/_{2.2}$ and $^{1}/_{2.6}$, while also the specimen from the Philippines mentioned by Cowles (1915) has this relation $^{1}/_{2.6}$. This difference thus seems to be very constant, and I can not agree with Coutière in considering it of minor importance. In combination with some other differences I think it of specific value.

The three other points indeed are of no value as Coutière pointed out. The dentition of the fingers of the large chela of the adult male varies in both the East African and the Malay specimens in the same way, which also is shown by my material. The relation between the length of the uropodal endo- and exopods is variable, which is already pointed out above for my Malay specimens, while Coutière showed the variability in the East African specimens.

The main difference between the two forms thus lies in the distance over which the dorsal teeth of the rostrum continue on the carapace. A further difference is the fact that the rostrum generally is somewhat longer in the East African specimens, though this is of very little importance. A third character is the fact that in *M. lepidactylus* the number of dorsal teeth of the rostrum placed on the carapace is smaller (3-5) than that number (5-7) in the present species from the Malay Archipelago. Furthermore the carpus of the large chela of the adult male is as long as or even shorter than the merus in *M. lepidactylus*, while in the eastern form it constantly is somewhat longer than the merus. As no material of *P. lepidactylus* from E. Africa is at my disposal, it is possible that more differences may be found between the two species. It is to be regretted that Coutière in his extensive report on *P. lepidactylus* does not give the relations between the various joints of the second legs of his material.

Palaemon hirtimanus of Olivier undoubtedly is identical with *Palaemon lepidactyloides* De Man, as is shown by the description of Olivier (1811) and the figure of Latreille (1818). De Man (1892) gave additional details (e.g., the measurements of the joints of the second legs) of Olivier's types, which also agree with my specimens of *P. lepidactyloides*. It is to be regretted that De Man gave no more details about the specimens and also did not figure them. That *P. hirtimanus*

is not identical with *P. lepidactylus* is shown by the situation of the rostral teeth on the carapace and by the fact that the carpus of the larger leg of the male is longer than the merus. Also J. Roux's (1934) specimens, which he considered to be *Palaemon hirtimanus* from Mauritius are in good agreement with my material.

The largest specimen labelled "Indian Archipelago" (Museum Leiden) lacks the oral parts (only the left maxillula is still present). These oral parts obviously have been dissected by W. de Haan for examination and are figured by him on pl. P of the volume on the Crustacea of Fauna Japonica as *Palaemon hirtimanus;* the shape of the above mentioned maxillula perfectly agrees with that figured by De Haan. The oral parts themselves are no longer extant in the collections of the Leiden Museum. Though of many other species of Crustacea the oral parts dissected by Dr. de Haan still are present, being dry and pasted on cardboard, none of those of the Palaemonidae could be found.

The above specimens from Maumere, Flores (Museum Leiden) have been mentioned by De Man (1893) under the name *Palaemon placidulus*; examination of this material showed that it in reality belongs to *M. hirtimanus.* Among the specimens identified by De Man (1892) as a new species *Palaemon placidulus,* there are several specimens (mostly females and juveniles) which belong to *M. hirtimanus,* as is shown by the shape of their first legs and the scaphocerite; these specimens came from Ndona and Lela Rivers, Flores. In the same paper De Man (1892) described and figured a form, of which ovigerous females were at his disposal. He thought these specimens possibly to be identical with *M. placidulum.* In the material at hand only one of these females is present, it distinctly shows to be *M. hirtimanus.*

The specimen from Batumerah, Amboina and some of those from Tuba River, W. Ceram, identified by J. Roux (1923) as *Palaemon lepidactylus* var. *lepidactyloides* (= *M. hirtimanus*) in reality belong to *M. placidulum.*

Distribution. The present species lives in fresh water. It occurs in Oceania and the Malay Archipelago and extends westwards to Réunion and Mauritus; on Madagascar and in E. Africa it seems to be replaced by *M. lepidactylus.* The records in literature are: Indopacific region (Sharp, 1893), Réunion (A. Milne Edwards, 1862), Marsouins River, Réunion (J. Roux, 1934), Mauritius (H. Milne Edwards,1837; De Man, 1892; Sharp, 1893), Tamarind Falls, Mauritius (Ward, 1942), Rodriguez (Miers, 1879), Indian Ocean (Olivier, 1811; Lamarck, 1818; H. Milne Edwards, 1837, 1838; White, 1847), Malaysian Region (Miers, 1880), Sisiman, Bataan Province, Luzon (Cowles, 1915; Estampador, 1937), Tomohon River near Menado, N. Celebes (Schenkel, 1902), Palopo, Central Celebes (De Man, 1892), Batjan, N. Moluccas (J. Roux, 1923), Riuapa and Tuba Rivers and rivulet near Honitetu, Ceram, S. Moluccas (J. Roux, 1923), Kambera River and Mao Marru, Sumba, Lesser Sunda Islands (J. Roux, 1928a), Flores (Von Martens, 1876), Raka-mbaha, W. Flores (De Man, 1892), Rana Mesè, W. Flores (J. Roux, 1929), Ndona River near Ende, and Lela River near Sikka, S. Flores (De Man, 1892), Maumere, E. Flores (De Man, 1892), Besar Island (= Groot Bastaard) near E. Flores (De Man, 1893), Fiji (Ortmann, 1891).

Macrobrachium placidum (De Man) (fig. 51b)

Palaemon (*Macrobrachium*) *placidus* De Man, 1892, Weber's Zool. Ergebn., vol. 2, p. 483, pl. 28 fig. 46.

Palaemon (*Macrobrachium*) *placidus* Nobili, 1900, Ann. Mus. Stor. nat. Genova, vol. 40, p. 488.
Palaemon (*Macrobrachium*) *placidus* J. Roux, 1932, Arch. Hydrobiol., suppl. vol. 11, pp. 566, 572.

Museum Leiden

Java. — 4 specimens (1 ovigerous female) 44-71 mm.
Indian Archipelago. — 4 specimens 63-78 mm.
Indonesia. — 1 specimen 76 mm.
Locality unknown. — 1 specimen 63 mm.

Museum Amsterdam

Kajutanam, N. of Padang, W. Sumatra; 1888-1889; leg. M. Weber; cotypes of *Palaemon placidus* De Man. — 7 specimens 39-81 mm.

The present species is closely related to *Macrobrachium hirtimanus*, which it resembles in almost all characters. The main differences between the two species may be found in the shape of the second legs of the adult male. In *M. hirtimanus* the palm of the smaller second leg is about as long as broad (the relation length/height varying in adult males between 1.22 and 1.25, in young specimens becoming 1.5), in *M. placidum* it is about twice as long as broad (varying in old specimens between 2.0 and 2.3, in young specimens becoming 2.5). Also the relations between the joints of this leg are different, so the fingers are about as long as the palm (in *M. hirtimanus* the fingers are 1.5 times to twice as long as the palm). Also the palm of the larger second leg in *M. hirtimanus* is less elongate than in *M. placidum*. The shape and the formula of the rostrum is the same in the two species, just like the situation of the hepatic and antennal spines, the smoothness of the carapace and the abdomen, the shape of the telson, the eyes, antennulae and antennae. The first tooth of the rostrum is separated from the posterior margin of the orbit by $^1/_{2.0}$ to $^1/_{2.4}$ of the total length of the carapace. The oral parts of the present species are typical. The first legs (fig. 51b) reach about with $^3/_4$ of the length of the carpus beyond the scaphocerite, being thus longer than in *M. hirtimanus*. The last three legs much resemble those of *M. hirtimanus*, but they generally are shorter, the third reaches only with the dactylus beyond the scaphocerite. The second legs are built on the same plan, but never seem to develop such high palms as in *M. hirtimanus*. The measurements (in mm) of the various joints of the second pereiopods of my material are given here:

material	body-length	sex	leg [1]	fingers	palm		carpus	merus	ischium
					length	height			
Indian Archipelago	78	♂	l	24.0	25.0	10.0	22.0	18.0	12.0
			s	17.5	16.0	7.0	18.0	15.0	11.0
	74	♂	l	23.0	22.5	10.5	21.0	16.0	12.0
			s	17.5	15.0	7.5	17.0	14.0	9.0
	63	♂	l	18.0	17.5	8.0	17.0	14.0	9.5
			s	13.0	11.0	5.0	12.0	10.0	7.0
	64	♂	s	14.0	12.5	6.0	13.5	11.5	8.0
Indonesia	76	♂	l	20.0	22.0	9.0	20.0	17.0	11.5
Locality unknown	63	♂	l	13.0	14.0	6.5	14.0	12.0	7.0
			s	10.0	9.0	4.5	10.5	10.0	7.0
Kajutanam	81	♂	l	21.8	21.1	8.0	22.5	17.0	11.0
			s	16.0	16.0	7.0	18.0	15.0	10.0
	59	♂	l?	21.0	18.0	8.0	21.0	14.0	9.0
	56	♂	l	15.0	15.0	7.0	15.0	13.0	9.0
			s	10.0	10.0	4.0	11.0	10.0	7.0
	53	♀	—	6.0	5.5	2.5	10.0	6.7	6.7
	46	♂	?	4.0	3.8	1.6	6.3	4.6	4.4
	48	ov.♀	—	6.0	4.5	2.3	8.5	6.0	5.2

1) l = larger leg, s = smaller leg.

In the females and the young males the second legs are equal in shape and size. The fingers close over their entire length and have the cutting edges provided with some three denticles in the proximal part. All the joints are slender and beset with numerous spinules. A transverse blue band is visible over the fingers of the second legs. The spinulation of the last three legs is already visible in young specimens and in females.

The eggs are numerous and small, they are 0.5 to 0.6 mm in diameter. The ovigerous female is 48 mm long.

It is to be regretted that no adult males are present in the material from Java (Museum Leiden), the females, however, posses sufficient characters to make their identification certain.

Though the present species is closely related to *M. hirtimanus*, the differences offered seem to be constant enough to be of specific value. The species more or less forms a transition between *M. hirtimanus* and *M. placidulum*.

The specimens from Kajutanam (Museum Amsterdam) are the types of the present species.

Distribution. The species lives in fresh water. It has been recorded only from W. Sumatra, in the region of Padang: Kajutanam, N. of Padang (De Man, 1892), Airmantjur near Singalang mountain (Nobili, 1900), near Padang (J. Roux, 1932).

Macrobrachium placidulum (De Man) (fig. 51c)

?Palaemon spinimanus Latreille, 1818, Tabl. encycl. méth., vol. 24, p. 5, pl. 319 fig. 1.
Palaemon (*Macrobrachium*) *placidulus* p.p. De Man, 1892, Weber's Zool. Ergebn., vol. 2, p. 489, pl. 28 fig. 48.
Palaemon (*Macrobrachium*) *placidulus* p.p. De Man, 1893, Notes Leyden Mus., vol. 15, p. 305.
?Palaemon (*Macrobrachium*) *placidulus* Nobili, 1900, Ann. Mus. Stor. nat. Genova, vol. 40, p. 490.
Palaemon (*Macrobrachium*) *placidulus* De Man, 1915, Zool. Jb. Syst., vol. 38, p. 444.
Palaemon (*Macrobrachium*) *placidulus* J. Roux, 1917, Nova Guinea, vol. 5, p. 601.
Palaemon (*Macrobrachium*) *lepidactylus lepidactyloides* p.p. J. Roux, 1923, Capita Zool., vol. 2, pt. 2, p. 11.
Palaemon (*Macrobrachium*) *placidulus* J. Roux, 1928a, Treubia, vol. 10, p. 219.
Palaemon (*Macrobrachium*) *placidulus* J. Roux, 1933, Rés. sci. Voy. Pr. Belg. Ind. or., vol. 3 pt. 14, p. 7.
Palaemon (*Macrobrachium*) *placidulus* J. Roux, 1934a, Rev. Suisse Zool., vol. 41, p. 218.

Siboga Expedition

Station 33, River near Pidjot, Lombok; March 25, 1899. — 1 specimen 54 mm.
River near Station 114, entrance to Kuandang Bay, N. Celebes; June 9-11, 1899. — 1 specimen 52 mm.
Station 131, Beo, Talaud Islands; reef exploration; depth 13 m; bottom mud and sand; July 24 and 25, 1899. — 1 specimen 38 mm.

Museum Leiden

Wukur River near Sikka, S. E. Flores; 1888-1889; leg. M. Weber; cotypes of *Palaemon placidulus* De Man. — 4 specimens (2 ovigerous females) 34-38 mm.
Besar Island (= Groot Bastaard), off N. E. Flores; 1891; leg. H. ten Kate. — 10 specimens (9 ovigerous females) 40-52 mm.
Celebes; April 18, 1878; leg. C. B. H. von Rosenberg. — 2 specimens 52 and 55 mm.
Hollandia, N. New Guinea; May 19, 1911; Dutch N. New Guinea Expedition 1910-1911. — 2 specimens 44 and 52 mm.

Museum Amsterdam

Pajeti, Sumba. — 5 specimens 33-39 mm.

Raka-mbaha (= Mbawa), S. Flores; river above waterfall; 1888-1889; leg. M. Weber; cotypes of *Palaemon placidulus* De Man. — 3 specimens (1 ovigerous female) 21-37 mm.

Ba River, W. of Ende, S. Flores; 1888-1889; leg. M. Weber; cotypes of *Palaemon placidulus* De Man. — 2 specimens (1 ovigerous female) 31 & 38 mm.

Lela River near Sikka, S. E. Flores; 1888-1889; leg. M. Weber; cotypes of *Palaemon placidulus* De Man. — 15 specimens (13 ovigerous females) 26-35 mm.

Wukur River near Sikka, S. E. Flores; 1888-1889; leg. M. Weber; cotypes of *Palaemon placidulus* De Man. — 20 specimens (13 ovigerous females) 19-39 mm.

Koinino River near Kupang, Timor; 1888-1889; leg. A. Wichmann; cotype of *Palaemon placidulus* De Man. — 1 ovigerous female 31 mm.

River near Palopo, Luwu, Central Celebes; 1888-1889; leg. M. Weber; cotype of *Palaemon placidulus* De Man. — 1 ovigerous female 43 mm.

Bangkalan River, Salajar, off S. W. Celebes; 1888-1889; leg. M. Weber; cotypes of *Palaemon placidulus* De Man. — 4 specimens (1 ovigerous female) 35-44 mm.

Tuba River, W. Ceram; February, 1910; leg. L. F. de Beaufort. — 11 specimens 34-53 mm (1 specimen bopyrized).

Batumerah, Amboina; December 6, 1909; leg. L. F. de Beaufort. — 1 specimen 24 mm.

Waitjiri River, N. New Guinea, 2° 26'.5 S, 140° 34'.5 E; May 23, 1903; Dutch New Guinea Expedition, 1903. — 5 specimens (2 ovigerous females) 27-37 mm.

The present species is closely related to both *M. hirtimanus* and *M. placidum*. It has with these species in common the narrow and straight rostrum, which reaches to the end of the second, or at most to the end of the third segment of the antennular peduncle, the rostral formula $\frac{4\text{–}6)\ \ 11\text{–}12}{1\text{–}2}$ also is the same, while the dorsal teeth of the rostrum begin slightly before the middle of the carapace (the relation between the length of the toothed part of the rostrum and the length of the entire rostrum varies in the present species between $^1/_{2.0}$ and $^1/_{2.4}$). The carapace always is smooth. The hepatic spine is placed rather close behind the antennal spine, on a lower level, but the distance between the two spines is rather variable.

The abdomen and telson have the same shape as those of the two previous species, just like the eyes and antennulae.

The scaphocerite is about 2.5 times as long as broad, it has the outer margin somewhat concave and ending in a strong tooth, which almost reaches the end of the lamella, which is more rounded and not so much produced as in *M. hirtimanus* and *M. placidum*.

The oral parts are typical.

The first pereiopods (fig. 51c) reach with part of or with the entire carpus beyond the scaphocerite. The fingers are as long as the palm, the carpus is somewhat less than twice as long as the chela and is 1.5 (in old males) to 1.25 times as long as the merus. The adult male has (like in the two previous species) the second legs very unequal. The shape of these legs has already been extensively described and figured by De Man (1892). I give here some measurements (in mm) of the joints of the second legs in my material:

material	body-length	sex	leg [1]	fingers	palm		carpus	merus	ischium
					length	height			
Salajar	44.0	♂	l	9.0	15.0	6.0	13.0	10.2	6.2
			s	9.3	10.0	4.5	11.0	9.0	6.7
	35.0	♀	l	4.2	4.2	2.3	4.6	4.8	4.2
			s	3.2	3.7	1.2	3.8	4.8	3.2
Siboga Sta.33	54.0	♂	l	12.7	18.0	7.0	15.5	13.5	8.7
			s	11.0	13.0	6.0	14.0	12.0	8.0
	61.0	ov.♀	?	6.7	4.9	2.1	5.8	6.2	5.5
Celebes	56.0	♂	l	11.0	19.5	7.2	16.0	14.0	9.0
			s	11.0	13.5	6.0	14.5	12.0	8.5
Hollandia	52.0	♂	s	10.5	12.0	5.0	13.0	10.0	8.2
	44.0	♂	s	8.0	9.5	4.2	10.5	9.0	7.0
Wukur River	38.0	♂	l	6.0	10.0	4.5	7.2	6.5	5.8
	33.0	ov.♀	l	3.8	4.8	2.2	4.8	4.0	3.2
			s	3.2	3.1	1.2	4.0	3.5	3.5
	37.0	♂	l	8.0	11.6	4.5	10.5	8.0	6.0
			s	7.0	8.0	3.3	8.5	7.2	4.6
Besar Island	52.0	♂	l	13.0	17.0	6.2	17.0	14.0	10.0
			s	9.0	10.8	4.7	12.0	10.5	7.8
Pajeti	39.0	♂	s	7.0	7.2	3.2	7.3	6.0	5.0
Raka-mbaha	38.0	ov.♀	l	5.3	7.0	2.9	5.4	5.2	4.2
			s	4.1	4.0	1.5	5.0	5.0	4.0
Palopo	43.0	ov.♀	s?	6.0	5.0	2.8	7.0	7.0	4.5

1) l = larger leg, s = smaller leg.

The third pereiopod reaches with the dactylus, or at most with a small part of the propodus beyond the scaphocerite, while the fifth leg largely fails to reach the end of that scale. The relation between the various joints is like that in the two previous species, while all three pairs of legs in the males as well as in the females are covered with scale-shaped tubercles. Behind the apex of the dactylus a lobiform process is visible, which may be compared with a similar structure found in *Palaemon paucidens* De Haan (vid. p. 73), and which also is found in *Macrobrachium hirtimanus* and *M. placidum*.

The pleopods and uropods are normal in shape.

The eggs are numerous and small, their diameter varies between 0.5 and 0.7 mm.

Though the differences in the second legs of the adult males of *Macrobrachium hirtimanus, M. placidum,* and *M. placidulum* seem to be constant, so that the males of these three species easily may be separated, it is extremely difficult to find constant differences between the females and the young specimens. *M. placidum* and *M. placidulum* have the last three pairs of pereiopods shorter than those of *M. hirtimanus*. *M. placidulum* may be separated from the two other species by the more rounded anterior margin of the scaphocerite and by the very long first legs, which reach with almost the entire carpus beyond the scaphocerite, while also the hepatic and antennal spines generally are placed closer together than in the other forms. Further in females of *M. placidum* the carpus of the second legs is distinctly longer than the merus, while in *M. hirtimanus* and *M. placidulum* the merus is as long as or longer than the carpus. The females of *M. placidulum* have the second pereiopods unequal in strength, while they are equal in *M. hirtimanus*. Each of the characters mentioned here

is rather vague, but together they form a strong indication for the identity of female and young specimens, especially the character of the long and slender first legs of *M. placidulum* is constant and is of large value.

Among the typematerial of *P. placidulus* some specimens (ovigerous females and juveniles) of *M. hirtimanus* were present, namely all specimens reported by De Man under the name *P. placidulus* from Ndona River, Flores and 2 ovigerous females from Lela near Sikka, Flores. Also the material from Maumere, E. Flores assigned by De Man (1893) to the present species certainly does not belong here, but is *M. hirtimanus*. This material consists of 4 ovigerous females and one young male (not 5 ovigerous females as De Man incorrectly states). The specimens from Amboina and part of those from Tuba River, W. Ceram reported upon by J. Roux, 1923, as *Palaemon lepidactylus* var. *lepidactyloides* do not belong to *M. hirtimanus*, but to the present species. All these incorrect identifications are due to the large resemblance between the females of *M. hirtimanus* and *M. placidulum*, which, to enlarge the difficulties, often are found together in one locality. The difference in the shape of the first leg made it possible for me to separate the two forms in my material.

Distribution. The species lives in fresh water, though the record from Sta. 131 of the Siboga Expedition, if correct, seems to indicate that it sometimes is found near the coast in salt water; there is a possibility, however, that the label of the material from that Station is not correct and that the material was found in a river near Beo, Talaud Islands. *Macrobrachium placidulum* is recorded in literature from: Lolomboli, Nias ? (Nobili, 1900), Pajeti, Sumba (J. Roux, 1928a), Raka-mbaha, S. Flores (De Man, 1892), Ba River near Ende, S. Flores (De Man, 1892), Lela and Wukur Rivers near Sikka, S. Flores (De Man, 1892), Besar Island, off N.E. Flores (De Man, 1893), Timor (De Man, 1893), Koinino River, near Kupang, Timor (De Man, 1892), Palopo, Luwu, Central Celebes (De Man, 1892), Bangkalan River, Salajar (De Man, 1892), Tuba River, Ceram (J. Roux, 1923), Batumerah, Amboina (J. Roux, 1923), Sorong, Doom Island, off N.W. New Guinea (J. Roux, 1933), Waitjiri River, N. New Guinea (J. Roux, 1917), Hollandia, N. New Guinea (De Man, 1915), Likding, New Hannover (J. Roux, 1934a).

Macrobrachium oenone (De Man)

Palaemon (*Macrobrachium*) *oenone* De Man, 1902, Abh. Senckenb. naturf. Ges., vol. 25, p. 784, pl. 25 fig. 49.
Palaemon (*Macrobrachium*) sp. De Man, 1902, Abh. Senckenb. naturf. Ges., vol. 25, p. 791.
Palaemon (*Macrobrachium*) *oenone?* De Man, 1915, Zool. Jb. Syst., vol. 38, p. 439, pl. 29 fig. 15.
Palaemon (*Macrobrachium*) *oenone papuana* J. Roux, 1927, Nova Guinea, vol. 15, p. 324, fig. 2.

Museum Leiden

Kau River, Halmahera; 1893-1894; leg. W. Kükenthal; cotype of *Palaemon oenone* De Man. — 1 specimen 52 mm.

Museum Amsterdam

Kau River, Halmahera; 1893-1894; leg. W. Kükenthal; cotype of *Palaemon oenone* De Man (♂ no. 5). — 1 specimen 45 mm.

The present species has been extensively described and figured by De Man. It is closely related to *M. coulesi* and *M. esculentum*, but the relations between these three species are not yet very clear. Of each form only a small number of specimens is known, which makes it very difficult to get a clear conception of the variability of the various characters.

I have only two specimens at my disposal; of one of these (the specimen of the Leiden Museum) the larger second leg is missing, so that I can add very little to make the situation clearer.

De Man (1915) mentioned an aberrant form from New Guinea, which was made by J. Roux (1927) the type of a new variety. This variety should differ from the typical form only in the shorter fingers of the large chela, which moreover should lack the anastomosing grooves. Furthermore the fingers of the smaller leg are not gaping, but are almost entirely closed.

The specimen of the Amsterdam Museum, which is the male no. 5 of De Man's type material of *Palaemon oenone,* is intermediate between the typical form from Kau as figured by De Man (1902) and the var. *papuana,* by having the second legs like in the var. *papuana,* but they indeed bear the anastomosing grooves on the fingers of the larger leg. Now the typical specimens of *M. oenone* are much smaller than the Papuan specimens, so that it is possible, as is also supposed by De Man, that these differences only are due to differences of age. I consider therefore the two forms as one species until more material may decide in this question. Also De Man's (1902) *Palaemon* (*Macrobrachium*) sp. in all probability must be placed here.

Distribution. The present species lives in fresh water and is reported from: Kau, Saluta and Soakonora, N. Halmahera (De Man, 1902), Pioneer Bivouac, Mamberamo River, N. New Guinea (J. Roux, 1927), tributary of the lower Sermowai River, N. New Guinea (De Man, 1915).

Macrobrachium cowlesi nov. spec.

Palaemon sp. Cowles, 1915, Philipp. Journ. Sci., vol. 9 sect. D, p. 397, pl. 3 fig. 11.

This species, which is closely related to *M. oenone* and *M. esculentum,* has been extensively described and figured by Cowles (1915). It is characterized by the curious pubescence of the palm of the large, and sometimes also of the smaller second leg. In *M. oenone* the palm, apart from some widely scattered hairs, is naked, in *M. esculentum* the entire palm is covered with woolly hairs, in *M. cowlesi,* however, the palm is naked except for two large patches of hairs in the proximal portion. Now the pubescence of the large chelae in the present genus is remarkably constant within the species, and therefore we safely may consider these three forms to be three distinct species. But as already pointed out under *M. oenone,* more material is needed to disclose the real relations between these species.

Distribution. *Macrobrachium cowlesi* is known only from 2 specimens from the Manila water supply (Luzon, Philippines).

Macrobrachium esculentum (Thallwitz)

Palaemon esculentus Thallwitz, 1891, Zool. Anz., vol. 14, p. 98.
Palaemon dulcis Thallwitz, 1891, Zool. Anz., vol. 14, p. 99.
Palaemon esculentus Thallwitz, 1892, Abh. zool.-anthrop. Mus. Dresden, 1890-91 pt. 3, p. 18, pl. 1 fig. 1.
Palaemon dulcis Thallwitz, 1892, Abh. zool.-anthrop. Mus. Dresden, 1890-91 pt. 3, p. 18, pl. 1 fig. 2.
non? *Palaemon* (*Macrobrachium*) *dulcis* Nobili, 1900, Ann. Mus. Stor. nat. Genova, vol. 40, p. 490.
Palaemon (*Macrobrachium*) *esculentus* De Man, 1902, Abh. Senckenb. naturf. Ges., vol. 25, p. 784.
Palaemon dulcis De Man, 1915, Zool. Jb. Syst., vol. 38, p. 443.

Thallwitz (1892) described and figured two species of the present genus from N. Celebes under the names *Palaemon esculentus* and *P. dulcis.* De Man (1902 and 1915) gave additional details of the types of both these species. The only difference between them may be found in the

shape of the second legs. In *P. dulcis* the fingers are shorter than the palm, in *P. esculentus* longer. Now the character of the relative length between the fingers and the palm of the large chelipede is very variable in this group, as we have seen for instance in *M. oenone*. As no other differences are found, the two forms, in my opinion, must be considered synonymous, the more as they originate from the same locality. Examination of more material is badly needed.

The loose chela from Buabua (Sumatra) referred by Nobili (1900) to *Palaemon aulcis*, does not belong here as the palm is naked. I can not make out, however, to which species that chela belongs.

Distribution. The present species is only known from Thallwitz's specimens which originate from North Celebes.

Macrobrachium geron nov. spec. (fig. 52)

Museum Leiden

Banka, E. of Sumatra; 1867; leg. J. A. Buddingh. — 1 specimen 61 mm.

Of this species only an adult male is at my disposal. The description of this specimen runs as follows:

The rostrum (fig. 52a) is directed straight forwards, it reaches slightly beyond the middle of the third segment of the antennular peduncle, and is, when compared with that of *M. hirtimanus*, rather high. The upper margin bears 11 teeth, the proximal of which are placed farther apart than the distals. Three of the upper teeth are placed behind the orbit, while the fourth is situated just above the posterior orbital margin. The upper margin of the rostrum is somewhat convex. The lower margin bears four teeth in the distal half. The carapace is scabrous by the presence of many small tubercles, which are most distinct in the anterolateral angles of the carapace. The hepatic spine is somewhat smaller than the antennal and is placed slightly below and distinctly behind the latter, which posteriorly continues in a short carina; the two spines do not lie in one line.

The abdominal segments are smooth. The pleurae of the first three segments are broadly rounded, those of the fourth and fifth are narrower. The fifth pleura ends in a blunt apex. The sixth segment is about 1.5 times as long as the fifth.

The telson is about 1.5 times as long as the sixth abdominal segment. The two dorsal spines of the telson are placed in the middle and at $^3/_4$ of the length of the telson. The posterior margin ends in a sharp median point, which is flanked by two pairs of spines, the inner of which is long and slender, distinctly overreaching the apex of the telson, the outer is very short. Numerous setae are present between the inner spines.

The eyes are normal in shape, just like the antennules.

The scaphocerite (fig. 52b) is about twice as long as broad. The outer margin is straight (or slightly convex in the basal part). The final tooth is strong, but just fails to reach the rounded apex of the lamella.

The oral parts are typical, as far as I can control without damaging the only specimen at my disposal.

The first pereiopod is slender, it reaches with half the carpus beyond the scaphocerite. The fingers are as long as the palm. The carpus is slightly less than twice as long as the chela, and about $^4/_3$ as long as the merus. The ischium is slightly more than half as long as the merus. The second

pereiopods are very uncqual. In my specimen the right leg (fig. 52c) is much stronger than the left, it reaches with the larger part of the carpus beyond the scaphocerite. The fingers of the larger leg measure 3/4 of the length of the palm. In the basal part of the finger the surface bears some spines, furthermore both fingers have their surfaces thickly covered with numerous tufts of long and soft

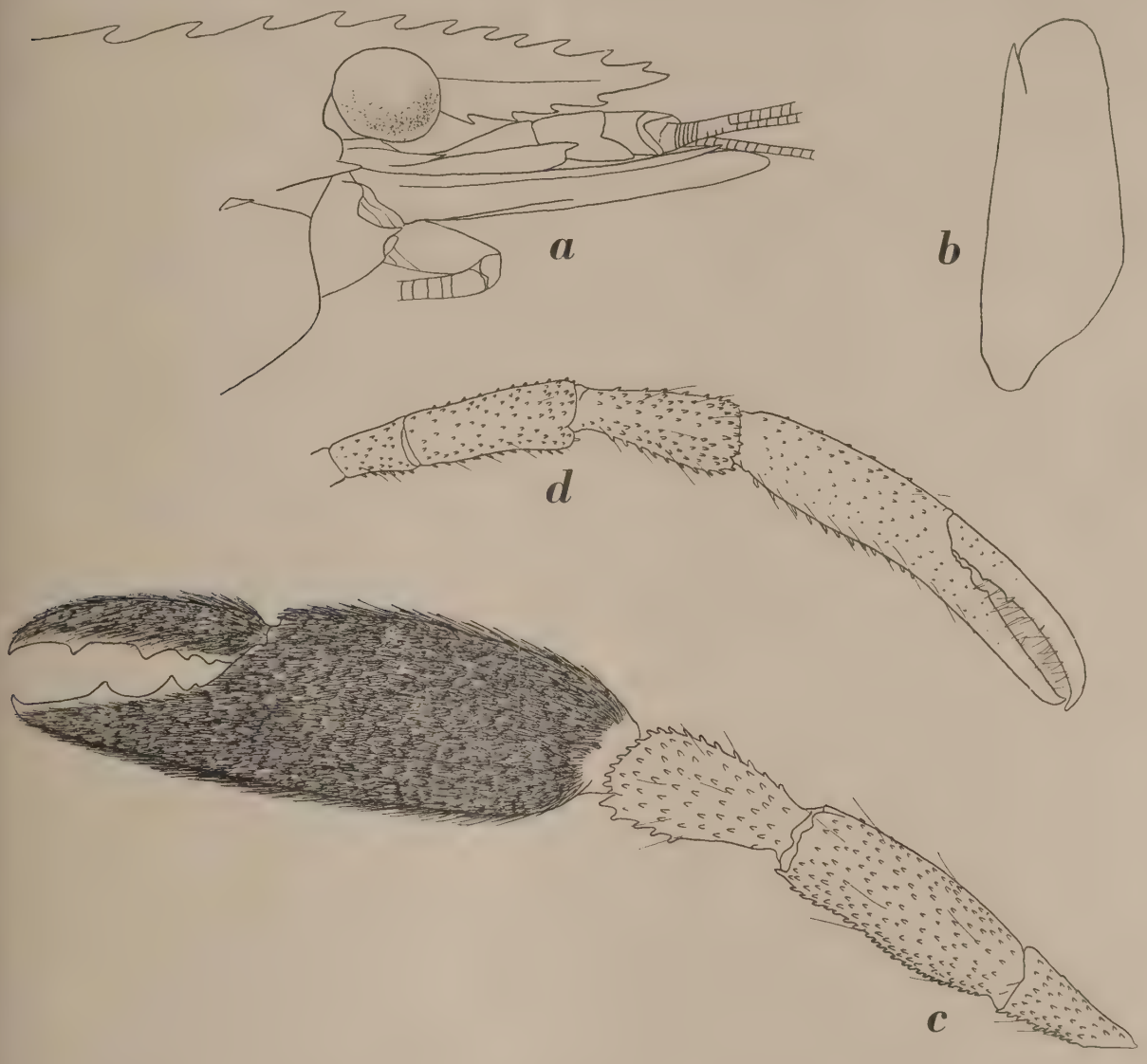

Fig. 52. *Macrobrachium geron* nov. spec. a, anterior part of body in lateral view; b, scaphocerite; c, larger second leg; d, smaller second leg. a, b, × 5; c, d, ×3.3.

hairs, which are placed close together. The cutting edge of the dactylus bears in the extreme proximal part two small teeth; further there are two large teeth on the cutting edge, placed so as to divide the cutting edge into three about equal parts. The fixed finger shows the same armament of the cutting edge; the large teeth of this finger are placed proximally of those of the dactylus. The palm is rather high and compressed, it is about twice as long as high and 1.7 times as high as broad. The entire palm is covered with spinules and with similar long hairs as are present on the fingers. The carpus is about half as long as the palm, it narrows proximally and bears numerous rather strong spines, which are

arranged in more or less distinct rows, the lower spines are stronger than the upper, some scattered stiff hairs are present too, but soft hairs as on the chela are entirely absent. The merus is 5/4 as long as the carpus, it is provided with similar spines and hairs as the carpus. The ischium measures 2/3 of the length of the merus, here too hairs and spinules as on the carpus are present. The smaller second leg (fig. 52d) reaches with less than half the carpus beyond the scaphocerite. The fingers are slender and gaping, they are about as long as the palm. Their cutting edge is provided in the proximal half with 4 or 5 teeth, which become larger distally. Inwards directed hairs are present at both sides of the cutting edge (in my specimen not many of these hairs are present, probably they have been lost during the long period, 79 years, of preservation). Small spinules are present in the basal part of the fingers. The palm is about twice as long as broad, it is only slightly compressed, numerous spinules are placed over the whole surface of the palm. The carpus much resembles that of the larger leg, it is 2/3 as long as the palm, while the merus is about as long as the palm. The ischium is 2/3 of the length of the merus. Ischium, merus, carpus and palm all are covered with spinules, which are more or less longitudinally arranged, and with some scattered stiff hairs, no soft hairs like those on the palm of the larger leg are present. The last three pereiopods are smooth. The third leg reaches with the carpus slightly beyond the end of the antennal peduncle. The other legs are detached and all lack the dactylus and propodus.

The shape of the pleopods and uropods is normal.

The present species is most closely related to *M. oenone, esculentum* and *cowlesi,* from all three of which it immediately may be separated by the small number of teeth on the cutting edges of the large chela, from *M. oenone, M. hirtimanus, M. lepidactylus, M. placidum,* and *M. placidulum* by the villose chela and again by the dentition of the fingers of the large chela.

I have ventured to describe this new species after a single specimen, because that specimen is a full grown male and because it is so very characteristic, differing strongly from all other known species.

The trivial name *geron* (γερων, greyhead) is chosen on account of the long grey (in my spirit specimen) hairs on the large chela, and at the same time on account of the respectable age of 79 years of the typespecimen.

ADDENDUM

The manuscript of the present paper was finished in 1946, but printing did not start till the end of 1949. I have tried to keep the text as much up to date as possible, and have inserted all species known to me, which were published up to 1950. Since the Zoological Record of 1947 and later could not be consulted by me, the list of species of this subfamily given at the beginning of the present paper necessarily had to remain incomplete as far as the species described after 1946 are concerned. When printing was already in an advanced stage I received K u b o's (1940-1949) papers on the Japanese Palaemonids. The species mentioned therein could still be inserted in the present work, though no extensive discussion of these highly important publications could be made in the text. T i w a r i's (1949) papers were received too late to have the new species described therein inserted in the list of all genera and species of Palaemoninae known to me (pp. 6 to 23 of the present paper) and in the key to the species of the genus *Macrobrachium* (pp. 105 to 111). T i w a r i's species therefore are enumerated in this addendum:

Macrobrachium Bate

choprai (Tiwari, 1949). Synonym: *Palaemon choprai* Tiwari, 1949. Distribution: N.E. India (Benares, Behar, Assam). Fresh water.

kempi (Tiwari, 1949a). Synonym: *Palaemon kempi* Tiwari, 1949a. Distribution: Chittagong district, Bengal, India. Fresh water.

villosimanus (Tiwari, 1949a). Synonym: *Palaemon villosimanus* Tiwari, 1949a. Distribution: India (Calcutta and Chittagong district), Burma (Rangoon).

Macrobrachium choprai and *M. villosimanus* are closely related to *M. rosenbergii* (De Man), which species they resemble in the shape of the telson and the presence of an elevated basal crest of teeth on the dorsal margin of the rostrum. *M. choprai* may at once be distinguished by the short rostrum, which fails to reach the end of the scaphocerite, and which has the lower margin provided with only 4 to 6 teeth. *M. villosimanus* is characterized by the shape of the second legs of the adult male, which have the carpus as long as, slightly longer, or slightly shorter than the chela, while the fingers of that leg are usually a little less than half as long as the palm. *Macrobrachium kempi* is stated by T i w a r i to be very close to *M. hendersoni;* it should differ from that species by having the fingers of the second legs without grooves and pubescence and by possessing a dense pubescence on the inner side of the palm.

N.B. The words carpus, merus, chela, etc., used in the key refer to the joints of the second pereiopods, unless stated otherwise.

INDEX

The generic, subgeneric, specific and subspecific names used in the lists of pp. 6 to 23, and 261, of the present paper are indexed here. Not inserted are the correct names of the species incorrectly assigned to the present subfamily. The subgeneric names are treated in this index as if they are generic names; so for instance *Palaemon* (*Nematopalaemon*) *tenuipes* may be found under *Palaemon tenuipes* as well as under *Nematopalaemon tenuipes*. In the above mentioned lists further references are given to those places in the text, where a species is treated more extensively.

The intention of this index is not only to facilitate finding a certain name used in the present paper, but also to provide an enumeration of every published nomenclatorial combination in which the generic and subgeneric names of this subfamily are involved, as far as they are known to me.

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